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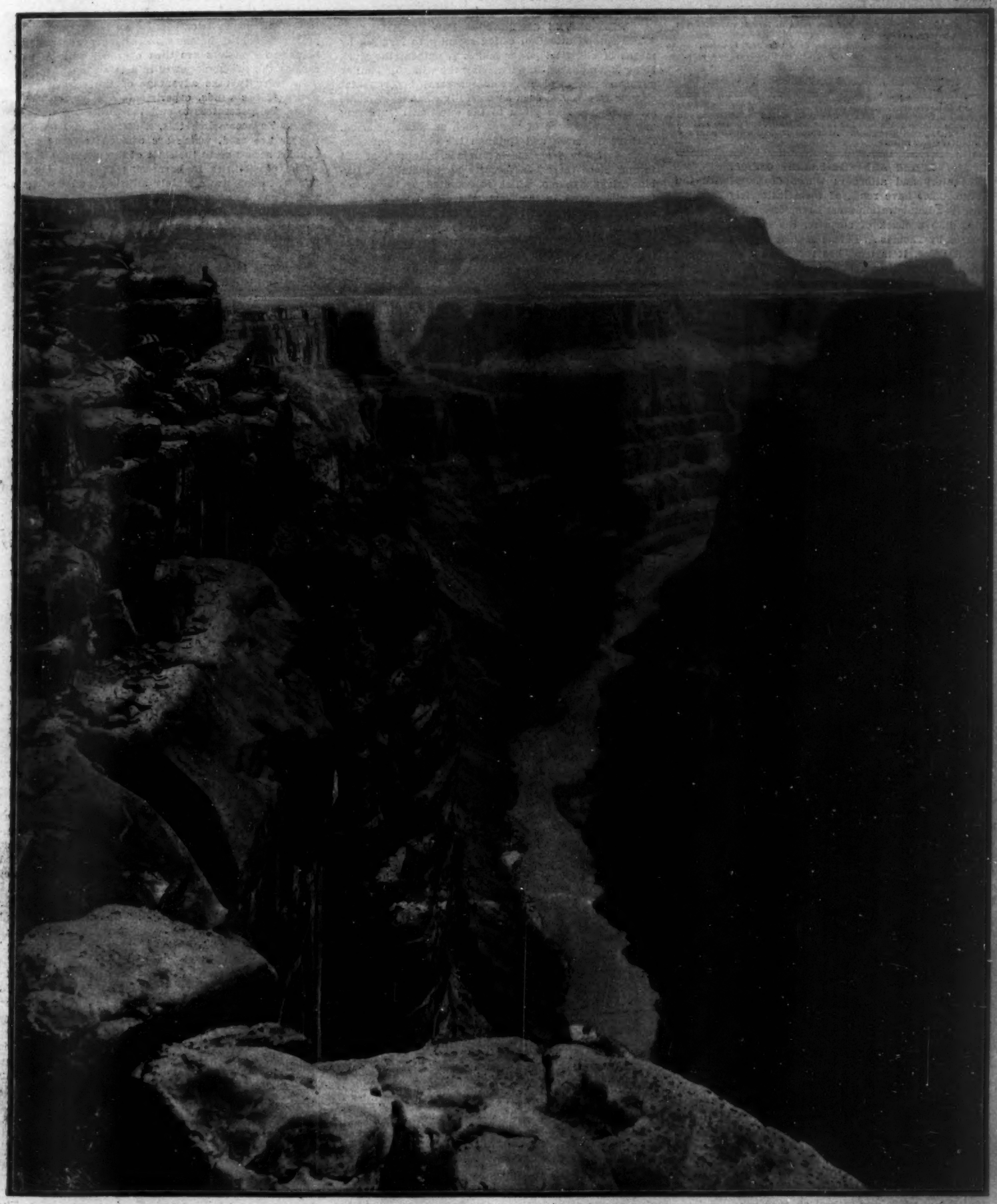

THE GRAND CAÑON OF COLORADO. A NEW NATIONAL PARK.—[See page 494.]

SCIENTIFIC AMERICAN

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NEW YORK, SATURDAY, JUNE 25, 1904.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

EDISON AND THE PATENT OFFICE.

Inventors and attorneys whose dealings with the Patent Office have rendered them intimately familiar with its administration must have received, with something like a shock of surprise, the charges recently brought by Thomas A. Edison against its officials. The Patent Office, it is true, has for years been overburdened with pending applications; and yet, its examiners have succeeded in the main in disposing of them with all the celerity that could reasonably be asked for under the circumstances, and with a thoroughness of examination that has added not a little to the Office's reputation for efficiency. So far as we are aware, no such sweeping accusation as that of Mr. Edison's, involving "incompetence, neglect of duty, and mal-administration," has ever been brought against the Office. For that reason the dismissal of all but one of the charges which have been brought brings with it a feeling of relief.

Until the publication of the Commissioner's report, containing an intelligible statement of the issues involved, it is impossible to give more than a meager statement of the actual facts. The controversy involves the validity of Ernst W. Jungner's patent for a reversible galvanic battery, in principle practically similar to the storage battery which Edison invented, and which has been prominently before the public for some three years. It would seem that, following the usual German practice, Jungner, in filing an application in this country, covered his invention in claims which were comparatively few in number and exceedingly limited in their scope. In order to comply with the Patent Office's rules of procedure, Jungner was requested to divide his application, because it was deemed to include two inventions. This was done. Subsequently an interference was declared between the original application of Jungner and Edison's application. Pending this interference, Jungner's alleged divisional application, covering one of the inventions claimed in his parent application, was passed to issue. The substance of Edison's first charge is that the issuing of this patent was fraudulent, for the reason that in Jungner's original application a narrow invention in storage batteries was disclosed, whereas, in the patent issued, a greatly enlarged invention was claimed. In his report the Commissioner concedes that the examiners failed to appreciate the nature of the enlarged description, that they were guilty of no intentional wrong-doing, and that the patent issued should never have been treated as a divided application, because it describes an invention quite different from that originally disclosed. No injury however resulted to anyone by calling the second application a "division."

Edison's second charge accuses the examiners of allowing claims to issue in the Jungner patent which they knew were unpatentable, which they had admitted were unpatentable, and which Jungner himself acknowledged were unpatentable. Only four claims, however, are specifically referred to in this charge. The Commissioner finds that the claims were properly issued, and that they covered patentable subject matter. This second charge can be discussed only after a full statement of the facts has been published. For the time being we must accept the Commissioner's decision as conclusive.

The third charge, in substance, is much the same as the second. It accuses the examiners of granting to Jungner a patent on an inoperative combination with full knowledge. This, like the second charge, was dismissed. It may be mentioned, however, that conflicting affidavits were submitted on both sides as to the operativeness of Jungner's invention, tending to show that the question was at best an open one.

Mr. Edison also took issue with the Patent Office in its declaration of the interference previously mentioned, asserting that the interference was improper, and that it deprived him of the opportunity of proving that Jungner's invention was inoperative. The Commissioner held that the examiner, in view of all the circumstances, had followed a time-honored custom of the Patent Office, and that, so far from having been refused a hearing in proving the inoperativeness of the Jungner device, Mr. Edison had been given every opportunity to prove his point, but had failed to take advantage of it.

From this view of the controversy, necessarily cursory by reason of the inadequate information given out by the Patent Office, it would seem that at best an error of judgment has been committed by one of the examining force—an error of a nature which even a justice of a Federal court might commit.

WIND-DRIVEN GENERATORS FOR FARMING.

The special attention called recently to farming by means of electrical power makes prominent the work being accomplished in harnessing the wind for similar purposes. In Germany, where several experimental electric farms have been successfully established, some attention has been given to the question of utilizing any natural source of power, such as water or wind. Both at Simmern and Quidnau the electric power is derived chiefly from steam engines, although at the former place there has recently been installed a turbine-driven dynamo, which is operated by the power from the river. In the West, where electrical plowing and harvesting have been used both experimentally and practically, the prime mover is operated by steam. Only on the California coast, where long-distance transmission of electrical power is obtained from the mountain streams, has any systematic attempt been made to harness the rivers for direct farming purposes.

The question of utilizing the wind for driving farm machines is of more practical importance to the farmers of the great prairie States than any other. There are no large streams for them to harness, and what few there are generally run low and nearly dry in summer. Water is at a premium in hot summers in the great corn and wheat belt; but wind is abundant. The southwest winds blow incessantly, carrying with them hot blasts of air, which often ruin the crops. This wind has been harnessed by the farmers for years past to irrigate their fields. The windmill has become almost as characteristic of many parts of the central West as it is of Holland. These windmills are employed solely for pumping water from the underground reservoirs, and without them thousands of acres of rich crops would annually be lost.

The variety of these home-made and commercial windmills is so great that the Department of Agriculture recently issued a special bulletin describing them, and giving such additional information as would tend to help farmers in other parts of the country to build similar structures. A good many of the windmills utilized the trees growing on the farms, and the apparatus was nearly all of a unique, home-made nature. But larger and more substantial windmills are now being put up in the rich farming regions, and private irrigation of farms is thus being extensively improved.

Since the investigations by the Department of Agriculture, a good many of these newer mills have been put to other uses than pumping water for irrigation. The wind has been harnessed for generating electricity to use generally on the farm. The first of these windmills were employed experimentally to generate electricity for lighting the barns and homes; but later their success stimulated some to more ambitious efforts. To-day a good many of them are being run to generate sufficient power to operate small motors.

The use of windmill power for generating electricity was tried successfully two years ago in Europe. At Hamburg and near Leipsic there are electrically-driven plants which derive their power entirely from the wind. The windmills are strongly built, and designed to take the wind at any angle. The regulation of the motor is obtained by means of an automatic switch, which cuts out the battery when the wind falls to a low pressure.

In the West windmills constructed for utilizing the power for electric generation are of the ordinary types, built to transmit the full power of the moving air currents to the generator located at the bottom of the structure. As the wind blows pretty constantly through the summer and fall months, there is seldom any lack of electric power for lighting or operating the small motors. In addition to generating electric power, the windmills are made so that the generator can be cut off, and the power can be used directly for pumping water in the usual way. During the months of July and August, when the droughts are at their highest, the need of water for irrigation is more imperative than power for operating farm implements. It is a season of comparative idleness on the farm until harvesting begins. By coupling the windmill to irrigating pumps at such times, the farmers secure double advantage. Later, when the crops are ready for harvesting, the windmills are once more harnessed to the electrical generator, and work with the machines begins.

Several windmills are worked together on some farms to operate the generators, and in this way ten-horse-power motors are working in the field continually. Several motors of two and three horse-power are operated in the field, and better results are obtained in this way than by one large single motor. By distributing the windmills and motors in different parts of the farms, more favorable results are obtained than by any other method.

A single large windmill of the home-made type or of modern commercial form will generate sufficient power to run a two, three, four, or even five-horse-power motor. Even when the wind is low and blowing only five or six miles an hour, sufficient power is obtained to develop two horse-power. When the wind increases to ten, fifteen, or twenty miles an hour, the capacity of the windmill becomes increasingly great. Ten-horse-power motors are then operated with as much ease as the two-horse-power in a low wind.

In order to take advantage of the change in the power of the winds, experiments are being made to adjust the generators to suit the force of the air currents. To accomplish this, a series of dynamos and motors are used, which are coupled together or uncoupled according to the state of the weather.

The possibilities in harnessing the wind for electrical farming are certainly alluring, and the experiments now being conducted indicate general interest in the subject. For the small farmer with a score or two acres of land, this method of using electricity for doing the mechanical work of his farm will prove far more beneficial than for the owner of thousands of acres. The latter will find water or steam power for operating his electric plant more satisfactory; but such installation would prove too costly for the ordinary small farmer. And after all, the small farmer is largely in the majority, and his needs are really paramount to those of the other class.

WOOD ALCOHOL FOR INDUSTRIAL PURPOSES.

The art of manufacturing and refining wood alcohol has steadily improved in this country in the past few years, and it is now equal to grain alcohol for nearly every manufacturing and industrial purpose. Its distribution has been widespread, and our exports of the alcohol have become an important item in the by-products of our forests. Simultaneous with the increase in the distillation of wood alcohol by improved methods has been the increase in its use. There are more than threescore industries that are quite dependent upon wood alcohol for their success, and anything that cheapens its cost and increases its supply intimately affects these industries.

But the cost of manufacturing wood alcohol has been too high in the past to make its use general in many other industries, that stand ready to utilize it as soon as some cheaper method of distilling it is invented. One of these is the burning of alcohol in motors for power production. The steady improvement of the alcohol motor abroad indicates that for certain purposes this form of motor will prove of general value, and in Germany several types of alcohol motors are quite commonly used. But the cost of the fuel must determine in this country at least the success or failure of the alcohol motor. With cheap crude-oil engines and the gas engine, the alcohol motor would have formidable competitors in the field, and it may be questioned whether the latter will prove universally successful here for many years to come.

The manufacture of wood alcohol, however, has a direct and important bearing on the iron industries throughout the country. The charcoal that was formerly used for the manufacture of pig iron was almost exclusively the product of the charcoal pits established for this purpose. The charcoal iron furnaces of Pennsylvania, New York, Maryland, and Michigan depended entirely upon the charcoal burners for their supply of this fuel, and the cost was always high and exorbitant. It was only when wood alcohol became an important by-product of charcoal that chemical works were constructed to supply the iron furnaces with their charcoal. In New York and Pennsylvania there are over eighty wood-alcohol and acetic-acid plants, which make a business of supplying the iron foundries with charcoal and producing alcohol as a by-product.

The chemical charcoal from the alcohol plants is made almost entirely of beech, birch, and maple trees that are fit for few other industries, and also from the tops and branches of hardwood trees which the lumbermen waste. Instead of destroying the forests, the modern chemical factories are working to preserve the supply of wood, for with the raw material exhausted they would be forced out of existence. It is estimated that fully ten thousand men are engaged in Pennsylvania and New York alone in cutting wood for the alcohol plants, and that their total product amounts to more than a million and a half gallons a year. The charcoal produced by the chemical plants equals more than a million bushels of the fuel per month. This

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enormous supply of charcoal furnishes the iron foundries with a fuel that is comparatively cheap, owing to the profits derived from alcohol. In recent years it has been said that charcoal is the by-product and wood alcohol the leading product of the chemical plants; but certain it is that, without the distillation of the alcohol from the wood, the cost of the charcoal would materially advance. Consequently, there would be forced an advance in pig iron, and a great many industries would be affected thereby.

In order to increase the supply of wood alcohol, a number of new chemical plants have been established in the last few years in different parts of the lumbering region of New England, where the waste of wood is enormous. In the hardwood forests the waste of trees is large through crowding and the production of many inferior growths. Millions of acres of New England forest lands contain to-day hardwood trees that are too inferior to have any marketable value except for firewood. Their existence in the woods is a detriment to the rest of the trees, and it would be wise to remove them. To utilize these inferior hardwood trees, and also the tops and limbs of the marketable trees, has become a question of paramount importance to the wood-alcohol manufacturers, and the new plants have been established in the forests for the purpose of making them of service. Owing to the value of the charcoal, as well as that of the alcohol, the plants have always been established in iron-manufacturing regions where there would be a ready market for both products.

Besides alcohol as a by-product, the manufacturers of wood alcohol are to-day obtaining successfully and economically acetate of lime from the same kilns. The acetate of lime thus obtained as a by-product is used chiefly for the manufacture of acetic acid. The by-products that can be obtained from a charcoal kiln are almost too numerous to mention, but the two chief ones in the modern chemical plant are the wood alcohol and acetate of lime. These are to-day very profitable in New York and Pennsylvania, where every battery of charcoal kilns has its chemical plant adjoining, so that the smoke which was formerly wasted is now drawn down into the still and utilized. The value of each cord of wood that is used for charcoal to-day is thus greatly increased. Indeed, from seventy-five to eighty per cent of the tree, branches and all, is to-day utilized by the modern, up-to-date charcoal maker.

Our exports of wood alcohol have been large in the past ten years, because of the large supply manufactured in this country; but should the alcohol motor prove of value as a power producer, either the supply of the fuel would have to be increased, or the export trade cut off. The increased use of wood alcohol in the arts and trades would to some extent be checked if the alcohol motor should prove an economical factor in our industrial life. But the supply of wild woodlands suitable for charcoal making, and incidentally for alcohol distilling, is almost unlimited, and there is a possibility of industrial development in this direction that can scarcely be measured to-day. The annual fires in our forests consume wood enough to produce millions of gallons of alcohol, and this enormous waste is only a part of the loss. The lumber mills, in spite of their efforts to utilize all parts of the trees, waste millions of feet of wood that would furnish the charcoal burner with excellent material for his work. By extending the charcoal and wood-alcohol industry to new districts, the wealth derived from our forests would multiply rapidly, and incidentally the cost of wood alcohol might be reduced to a point where it would prove a most efficient and economical fuel for the alcohol motors of the near future. In Germany at least all confidence is placed in the alcohol motor, and exhaustive experiments are being conducted there under the auspices of scientific and industrial societies.

THE INTERNATIONAL AUTOMOBILE RACE.

For the fifth time there has been a race for the International Cup. It was won by M. Théry in his 85-horse-power Richard-Brasier machine over the Saliburg circuit, in Germany, the distance being 348 miles, and the time being 5 hours, 50 minutes and 3 seconds. The average rate of speed of the winner was 60 miles an hour. On the Continent even the war was forgotten for the "blue ribbon" of the automobile world. The scheme of having a circuit like a race track is an excellent one, as the spectators have an opportunity of seeing the machine four times. At the end of the first round M. Théry was 32 seconds behind M. Jenatzy. At the second passage of the two racers before the grand stand, M. Théry was 1 minute and 40 seconds ahead, and his machine tore along the closely-guarded road at a speed that filled the spectators with the greatest possible excitement. As they swept past for the third time, M. Théry was leading by 9 minutes and 35 seconds. When those upon the grand stand realized that the gap was being widened, their interest and enthusiasm knew no bounds, and it is doubtful if the competitors were more excited than the vast audience. Never did a couple of hours seem so long. At last a trumpet call announced that the racer was coming. The suspense at this moment was intense, and finally M. Jenatzy arrived, and was greeted with cheers. M. Théry had started 28 minutes after M. Jenatzy, and at the end of the last circuit but one he was leading by more than 9 minutes. If he passed the line inside of 19 minutes he would have won the cup, but if he passed 20 minutes later than his competitor, M. Jenatzy retained the prize of the "Motor Derby." Then began awful minutes of suspense, five minutes, ten minutes, eleven minutes passed, when suddenly the trumpets sounded. M. Théry flew across the finishing line like a great bomb, and those on the grand stands on both sides of the road gave a mighty roar of welcome to the victor, the German Emperor taking off his cap and waving it in the air. The effort of M. Jenatzy was almost equally good, and this was appreciated by the spectators, who warmly cheered the ex-champion. Troops guarded every foot of the paths and roads leading to the course, and virtually lined the entire circuit. The weather was superb, and the road was in perfect condition. There were eighteen automobiles, representing six nationalities, engaged in the contest.

The winning machine has many novel features. It is of the four-cylinder type, and as has already been stated, is of 85 horse-power; but it can in no way be considered as a freak machine. One of the novel features of this car is a new form of cushion suspension, that is so flexible as to make the car ride easier, and without bouncing on the road. It also has a pressed steel frame with a secondary tubular frame, which carries the engine and the transmission case. There is a triple joint in combination with a slide joint, which makes a perfect flexible connection between the motor and the running gear. The cooler is composed of flat vertical tubes surrounded by fins. No pump is used for the circulation of water, the circulation being obtained by the thermo-siphon system. The clutch is a cone operating in the flywheel. The record of winners in the International Cup Race is as follows:

Year.	Winner.	Machine.	Course.	Distance, Miles.	Time. H.	M.	S.
1900	France, M. Charron	Panhard	Paris-Lyons	351½	9	09	00
1901	France, M. Girardot	Panhard	Paris-Bordeaux	348	9	00	00
1902	England, F. S. Edge	Napier	Paris-Innsbruck	288	10	00	00
1903	Germany, M. Jenatzy	Mercedes	Irish Circuit	366½	6	38	00
1904	France, M. Thery	Richard-Brasier	Homburg Circuit	348	5	50	03

It will be remembered that the International Cup was given by Mr. James Gordon Bennett.

M. CURIE'S WORK ON RADIUM EMANATIONS FROM MINERAL SPRINGS.

M. Curie has been making some determinations of the radio-activity of gases which are given off by mineral waters. Elster and Geitel have already shown that the gases of the air and the soil have a certain electric conductivity and can set up induced radio-activity in other bodies. Later on, it was found that the gases given off from mineral waters also possessed these properties, but in a much greater degree, and it has been recently shown that these effects are due to the presence in the gas of an emanation which is analogous to that of radium. Quantitative determinations of the gases collected at different mineral springs have been made at M. Curie's laboratory, as it is necessary to know the numerical values in order to compare the active power of the different gases. The companies sent the gases to the laboratory in well-sealed flasks. After drying, the sample of gas is placed in a closed brass cylinder which forms the outer part of an electric condenser. The inner part of the condenser is a brass rod placed in the axis of the cylinder and well insulated. The cylinder is given a charge of 200 to 300 volts, and the inner rod is connected to an electrometer. The gas, which becomes a conductor owing to the emanation it contains, allows a certain current to pass from the cylinder to the rod, and this current is measured by an appropriate method. The current is set up as soon as the gas is admitted. It increases somewhat rapidly for several hours, owing to the formation of an induced radio-activity on the inside surface of the cylinder. The current then decreases slowly, and this generally occurs about twenty-four hours after the introduction of the gas. The rate of decrease is the same as for the radium emanation. M. Curie made a table for the gases of different mineral springs of Europe. The numbers correspond to the current measured after leaving the gas 12 hours in the condenser. Given the current and the dimensions of the condenser, he could obtain the quantity of emanation which each gas contains, but it is preferable to compare directly with a standard bromide of radium solution. Thus with a solution containing 0.00001 gramme of radium bromide in a wash-bottle, at the end of a certain time he draws off the emanation which has accumulated, by means of a current of air. The charged air is sent into the condenser and the current is measured as before. This gives a standard of comparison. A few of the highest values of the emanation from different mineral waters may be given here. The water from Bad Gastein (Austria) has by far the strongest emanation, represented by the figure 360. After it come four samples of water from Plombières (France), at 47, 29, 28, 21 respectively. Bains les Bains and Luxeil (France) show 16 and 5.7. There is no doubt that the activity would be twice as strong if taken directly at the springs. A photographic plate is acted upon when left for a few hours under a bell jar with the Plombières water. M. Curie thinks that the action does not come from a radium salt dissolved in the water, but is due to some other cause which is not as yet explained. The presence of the emanation may account for the physiological action of some mineral waters, seeing that some springs have an action upon the system which is not to be explained from their chemical constitution.

CAMEOS AND THEIR HISTORY.

An interesting lecture was recently delivered by Mr. Cyril Davenport at the Royal Institution, London, dealing with the beautiful handicraft dating from Ptolemaic times—cameos. Mr. Davenport maintained that a first-rate intaglio on hard stone was the finest work of art which could be wrought by the hand of man. Intaglios, however, he explained, were normally intended for the purpose of making impressions, being therefore only a means to an end, whereas a cameo was complete in itself. He described the processes necessary to the production of a cameo, including the mysteries of the bow drill, cutting diamond point, and modern gem-cutter's lathe. A short account was also given of the early history of cameos on shells, eggs, and soft stones before the discovery of onyx as the material specially adapted for cameo-cutting. The Græco-Roman, and especially the Augustan, period was rich in cameos, and almost every great Roman wished to have his portrait cut in onyx. One of these, an exquisite portrait of the Emperor himself, which formerly belonged to the Strozzi collection, is perhaps the finest existing cameo. Such portrait cameos were practically indestructible, except by accident. The large cameos—the "Triumph of Bacchus" at the Vatican, the "Agate de Tibère" at Paris, and the "Gemma Augustea" at Vienna—were described in detail, and much curious information was given about the signatures on cameos. When these signatures were in relief they were undoubtedly genuine, but when in intaglio they might be forgeries, and many such signatures were known to have been forged during the Renaissance.

Regarding the glass pastes, the finest instances of glass cameos are to be found upon the Portland vase and the Auldjo vase, both in London, and on the Vase des Vendanges at Naples.

The remarkable change from the classical and mythological designs of Græco-Roman times to the Christian themes of the fourth century, when Constantine the Great became Christian, is curiously illustrated in cameos. Hercules was christened "David," Perseus and the Gorgon became "David and Goliath," and Venuses and Ledas were turned into "Virgin Marys;" and the great "Agate de Tibère" at Paris was only saved from destruction by being called the "Triumph of Joseph in Egypt." Then at the Renaissance they all went back again, and classical art recovered its lost position. The Renaissance cameo-cutters were very skilled workmen, but in spite of their general high level they had not succeeded in making any very important cameo, although the "Hymeneal Procession of Eros and Psyche" realized a high price. They were, however, eminently successful in the setting of gems. Pope Pius II. and Lorenzo de Medici bestowed high and learned patronage in the matter of engraved gems. Two very charming pendants with cameo portraits of Queen Elizabeth represented English work, and fine recent work has also been executed by Edward Burch, Marchant, Wray, and Brett. In Great Britain, however, the art was virtually lost, and Bernardo Pistrucci, chief engraver to the mint, who designed the beautiful group of St. George and the Dragon on the English sovereign coin, was really the last great cameo designer. In France fine work has been done in late years by Adolph David, Henri François, Georges Lemaire, and others.

Three submarines of an entirely new type have been laid down simultaneously at Cherbourg. They are to be known as the "Emeraude," "Opale," and "Rubis." They will have a double hull, as in the case of the "Narval" class. The length of each will be 147.64 feet; beam, 13.12 feet; displacement, 600 tons; motor, 600 horse-power, driven by electric power from accumulators when submerged, and by benzine or other vapor when on the surface; speed, 12 knots. According to the *France Militaire*, each boat will have two propellers, and carry six torpedo tubes.

NON-SKIDDING TIRES AND PROTECTIVE BANDS FOR USE ON THE WHEELS OF AUTOMOBILES.

One of the greatest difficulties that the automobilist has to contend with is the skidding or side-slipping of tires upon muddy roads. In cities, where asphalt pavement is now generally used, skidding is particularly dangerous, while even on a good macadam road it is perilous if, when traveling at a very high speed, the brakes are suddenly applied. What may happen under such circumstances is clearly shown in one of our illustrations, which depicts one of the Napier racers that successfully ran through the English eliminating trials for the Bennett cup race, (which were held recently on the Isle of Man), and then came to grief by skidding into a stone wall because its driver had suddenly applied the brakes when he was going very fast.

In order to determine which is the best non-skidding tire or detachable protective band, the Automobile Club of Seine and Oise, France, held a test this spring. Two of our illustrations show the appearance of the two types of tires—the Gallus "ferré" and "demi-ferré"—which won the greatest number of points. These tires have been on the market in France for several years, and it is not the first time that they have received awards. The cross-sectional view of a tire shows the Gallus "ferré." This tire has a flat tread with layers of canvas on either side of its center point. To this flat tread are riveted steel plates spaced a short distance apart. The tire, which is detachable, also has steel plates fastened to it on the outside of the bottom flanges for the purpose of preventing it from being cut by the wheel rim.

The other illustration shows the general appearance and a cross-section of the Gallus "demi-ferré" band. This band is of rubber and is cemented around the tire. In the center there is vulcanized to it a narrow rubber strip containing, near each side, tough cords. Steel plates are clamped around the sides of this strip and are spaced about their own width apart. The spaces of pure rubber between the steel plates make the band quite pliant and easy-riding, while the part of it protected by the plates is puncture-proof. The rubber spaces keep the tire from slipping on dry pavement, and the steel plates do the same on wet. Fast speeds and sudden stops can therefore be made on any road without danger of skidding.

Following the tests above mentioned, which were made at Versailles on a short stretch of muddy road, an endurance test of about 900 miles from Paris to Nice and return was given several different kinds of non-skidding tires, all of which held up very well. As a result of these tests, the following points were determined regarding this type of tire, or protective band: (1) Dry leather is not suitable for this purpose, since it cracks after having been wet. Leather having considerable natural grease in should be used.

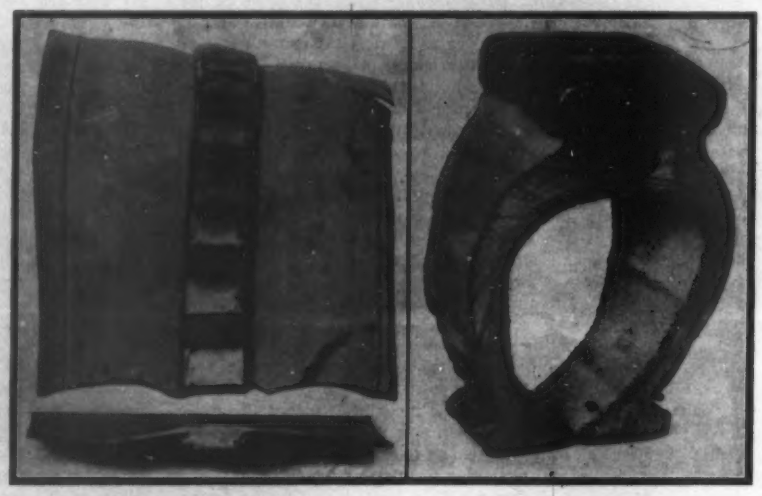
(2) Rivets must be securely fastened in place without washers, in order to avoid cutting out.

(3) With regard to the detachable protective bands, these should be fastened to the rim of the wheel at as many points as possible, if, indeed, it is not found desirable to fasten the edges to iron rings attached to the spokes on either side of the wheel. During the long-distance tests, the inconveniences of insufficient fastening of the protective band became apparent, since the side pull on the band every time there is a tendency to side-slip, is apt to cause the attaching strips to stretch and the band to slip to one side of the center of the tread.

(4) The protectors for the steering wheels have to fulfill other requirements than those on the driving wheels. The necessity of making the former retain the lateral play necessary to good steering requires the use of protective bands without any pads or transverse strips such as so efficaciously prevent the vehicle from side-slipping when applied to the rear wheels.

The objection has been raised that the non-skidding tire or band absorbs considerable power, and that consequently a machine equipped with them cannot be run as fast as when using ordinary pneumatics. Tests with both kinds of tires on an electric automobile showed that, for speeds above 18.63 miles an hour, the resistance to rotation of pneumatic-tired wheels is sensibly the same whether a plain pneumatic or a protected, or anti-skid, pneumatic tire is used. At speeds below 18.63 miles an hour, there is a difference which becomes greater as the speed lessens, plates of steel placed near together and riveted to a leather band offering, according to the experiments, more resistance to deformation than any of the other systems.

Some similar trials of non-skidding tires have been held recently by the Automobile Club of Great Britain and Ireland. In this case a 1,000-mile endurance test was first given the tires, after which tests were made as to their non-skidding abilities on ground covered with soft soap. The report of this test has not yet been made. An illustrated description of various non-skidding tires will be found in Supplement No. 1474.



The Gallus Non-Skid Band. The Gallus Protected Tire.

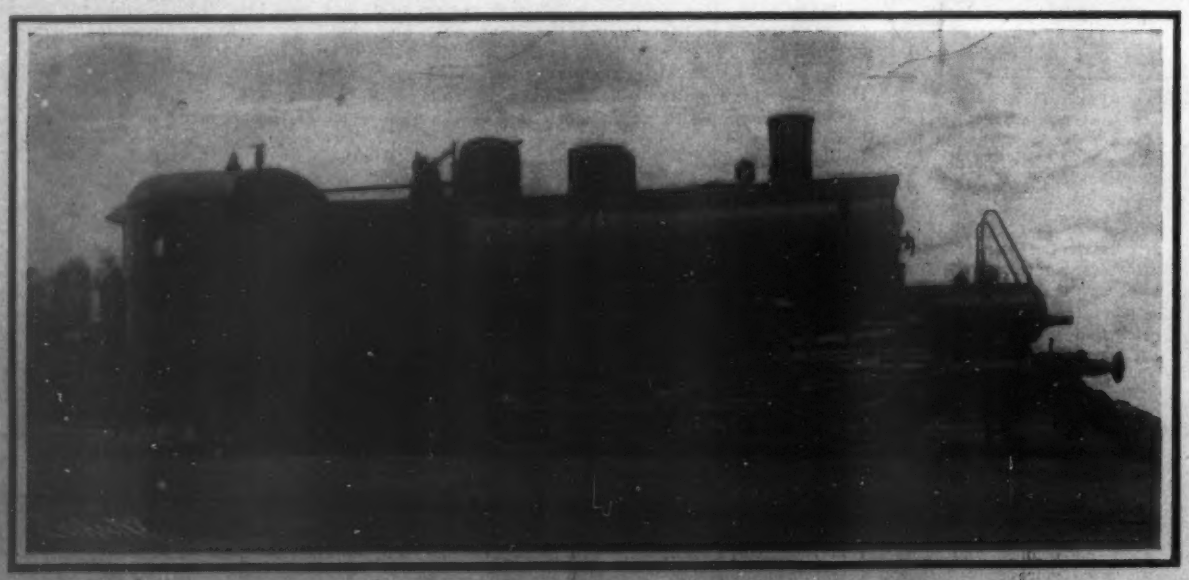
A Napier 100-Horse-Power Racer Damaged in a Skidding Accident.

PRIZE NON-SKIDDING TIRES IN THE FRENCH TEST.

SUCCESSFUL ITALIAN EXPRESS COMPOUND LOCOMOTIVE.

BY CHARLES B. KING.

The locomotive shown by the accompanying illustration is one of the most interesting of all highly successful modern locomotives. It would be difficult to find another engine, anywhere, which worked with an equal economy in fuel at equal speeds and equal loads per ton of locomotive dead weight—not simply for a single run, but for the closely-checked average results obtained in the course of a whole year. Its chief peculiarity of appearance is that it is a "front-header," both enginemen riding over the pilot under immensely increased advantages for safe operation of engine and traffic alike. This new location of the cab, as in electric locomotors, was, however, only a consequence, and not the object in building a locomotive with this arrangement. Had this engine, with its wide firebox, been mounted over the driving wheels, the boiler top would have been raised to the actual height of the smokestack, and in consequence there could have been no such projections as chimney or valves on top. To have adopted the usual arrangement, the four-wheeled pilot would have been placed in front, where its purpose would have been to carry the weight required for the connected wheels' adhesion—a useless addition, therefore—and then a four-wheel truck or an overloaded trailing axle would have been necessary below the firebox. Under these conditions it was preferable to place the four-wheeled truck where it would be useful, and then profit by the new position of the truck to run with the firebox leading. This was done, and the results on every point have since proved that this locomotive is indicated as the ultimate type which will meet the conditions of every railway where the size of the locomotive has reached the last limit in the constructional gage.



Hauling capacity at 62 miles an hour, 460 tons on the tender drawbar.

AN ITALIAN FOUR-CYLINDER EXPRESS COMPOUND LOCOMOTIVE "ADRIATIC" TYPE.

The new locomotives, belonging to the Rete Adriatica a Meridionali Railroads of Italy, haul the greatest express loads in the whole continent of Europe, and in excess of anything known outside of America. And weight for weight in locomotives (*compound* locomotives) their capacity to haul five

times their own average working weight of useful load at from 50 to 60 miles per hour is scarcely likely to have an equal even in the United States, leaving aside the question of coal economy. This is equal to saying —and any contradiction thereto would be exceedingly interesting and therefore welcome—that for a given number of thermal units expended these Italian engines pull more weight at a given speed than any other locomotive in the world. Thermal units are mentioned, and not coal quantities—than which nothing more misleading could ever be introduced in the estimate of a locomotive's fuel-value consumption, unless the caloric value of the coals actually used is reliably given.

These engines were designed for all speeds up to 82 miles per hour, but the state of Italian tracks and works prohibits more than 56½ miles per hour; but the writer has sometimes seen the tachograph recording 62 miles per hour with 400 tons on the tender drawbar; that is to say, 440 U. S. tons; or with the engine fully loaded, a gross load of over 550 U. S. tons. In freight service they pull gross loads of up to 1,030 U. S. tons.

The "Adriatic" compound system comprises four cylinders—two high-pressure on one side and two low-pressure on the opposite side of the locomotive—each pair having only one piston-valve operated by one valve-gear—Walschaert's.

With this arrangement of one valve distributing to the high-pressure and one to the low-pressure, it is possible to set the valves for different relative degrees of cut-off, according to the average velocities to be made by the locomotive. In the original Vauclain compound this was impossible. In French locomotives the engineers, although they have two sets of distributions in their hands, do not vary the relative cut-offs, once they have found the best relative points of cut-off for the four valves. Other four-cylinder locomotives require either four valve gears or else rocking-shafts; but in the "Adriatics" all this extra mechanism is avoided, and the dissymmetrical arrangement of the cylinders has not, in practice, been found to entail any inconvenience, the motion of the engine being, on the contrary, much steadier at high speeds, and in passing through curves, than any other locomotive known to the writer, including American types, which are in general such rough-riders as to bear no more comparison with the "Adriatics" than with the motion of a Pullman car. The explanation is that the "Adriatic" footplate is suspended over the long swing links of the front truck, where the shocks are completely dissipated before reaching the main frames.

LOOPING THE DOUBLE LOOP.

In the field of loop-looping which has become so immensely popular of late, professional as well as amateur wheelmen have developed an amount of zeal which is without doubt worthy of a better cause.

All of the most recent achievements, such as, for example, the ride through a loop of which a portion of the upper part has been removed, or looping a complete loop and then over a gap in the second ascent, or looping the gap without the attendant loop, are fundamentally questionable acrobatic feats, that always present more or less danger to the life of the performer.

As has already been remarked, the spectators lose interest in them more and more, and as a novelty of the season they will soon disappear from the programmes, particularly since they are too often attended with trifling and even serious accidents.

The latest novelty in this line is the invention of an ingenious wheelman of Berlin, Böttner by name, who has constructed a double loop, and happily performed the feat of passing through it on his wheel. It is most certainly the pinnacle of mad daring, and will at all events not very soon witness a rival in popular favor.

In this new loop, as we show in the cut, the performer, after he has passed through half of the large loop and with his head still down, must guide the wheel into the smaller loop and out of it again, his head being again turned toward the earth, upon the finishing arc of the larger loop. Just imagine with what velocity the performer is hurled through these two loops, and perhaps it may be possible to appreciate the stoical quietude of his nerves, his rare skill in managing his wheel, and above all the presence of mind necessary to a successful exit from the whirl.

Since the greatest possible speed is necessary to overcome the resistance offered by the two loops, the starting point is placed somewhat higher than ordinarily, and the first descent quite a little steeper; the retarding stretch is also built steeper than heretofore.

The whole performance is a ride of death in the true sense of the expression.

If this new sensation be exhibited in the Schumann circus, according to present plans, the intrepid wheelman will surely not finish without the most vociferous applause on the part of the breathlessly expectant public.

For the present Böttner has erected his double loop in an open lot in the southeastern section of Berlin, where he practises daily.—Illustrirte Zeitung.

A PHOTO-RELIEF MADE BY THE AUTOPLASTIC PROCESS.

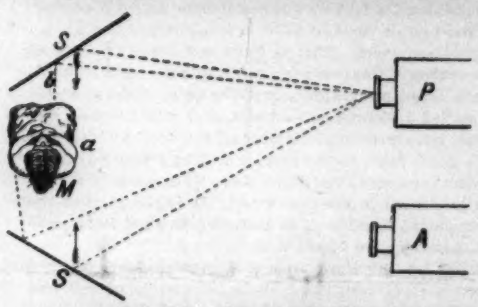
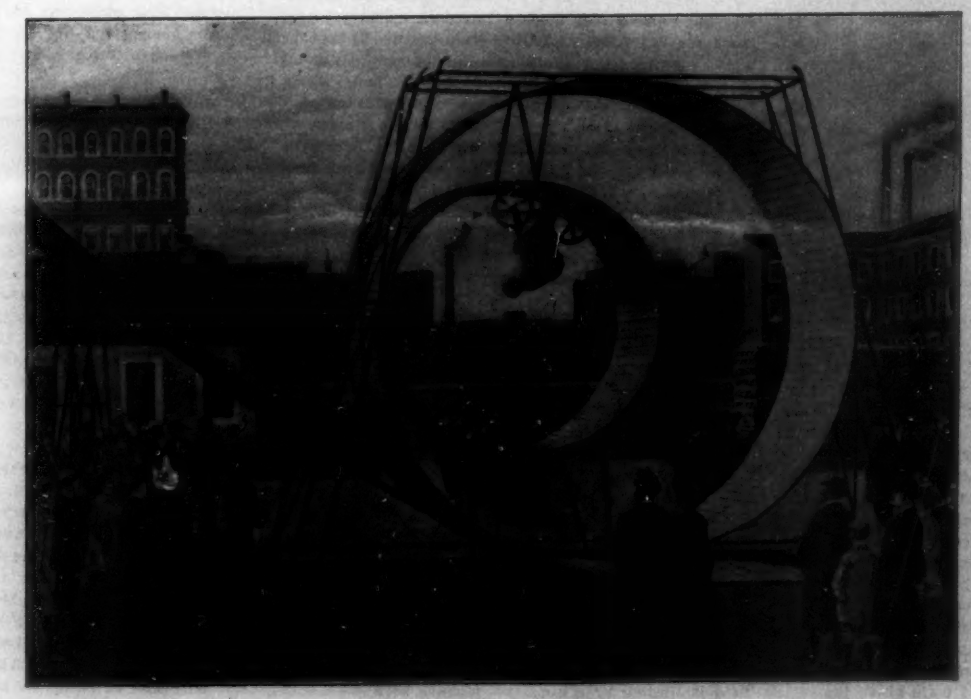


DIAGRAM SHOWING THE UNDERLYING PRINCIPLE OF THE AUTOPLASTIC PROCESS.



LOOPING THE DOUBLE LOOP.

THE AUTOPLASTIC PHOTOGRAPHIC PROCESS OF PRODUCING SCULPTURAL PORTRAITS.

BY DR. ALFRED GRADENWITZ.

Many attempts have been made to reproduce plastically the external shape of a model. The photographic camera has been used in this connection as far back as in 1861 by the Parisian sculptor Willème, by taking as many views as possible of the same object from different positions. These different views were then used in calculating the various dimensions of the model, and were translated to the molding block with the aid of a pantograph. The "photo-sculptures" produced in this way attracted, it is true, not a little attention. But the skill of the artist played a more important part in the process than the actual mechanical methods employed. In fact, in all of these methods, light alone by no means produces the plastic effect.

An interesting novel process was recently presented to the Berlin public, when Signor Carlo Baese, of Florence, delivered a lecture at the Urania. The new process necessitates only the taking of ordinary views of the object, whereupon, by means of photography, without any retouching or any correcting on the part of the artist, a relief corresponding perfectly to nature is obtained by employing the swelling property of chromium gelatine.

It has been known for some time that chromium gelatine will lose more or less its power of swelling according to the intensity of the light to which it is exposed, so that a layer of that substance, on being printed beneath a negative, will reproduce the different shades of the negative in relief. Heights of the relief upward of 1 centimeter (0.3936 inches) may thus be obtained readily, while the clearness of details is such that an artist would have the greatest difficulty in securing similar results. Attempts hitherto made to utilize this property, in connection with the production of plastic pictures, failed to give any positive results, as the principal condition, namely, the existence of a negative of a transparency proportional to the relief of the model, was not fulfilled. Mr. Carlo Baese has shown how success may be attained.

With ordinary negatives, the darkening of the plate, as need hardly be mentioned, depends on a multitude of factors other than the plasticity of the model. In the first place, the colors of the model play an important part, while the actual distribution of light is not without its influence.

In the Baese process the model is illuminated by means of a projection lamp, the light rays striking it at right angles to the direction in which the photograph is to be taken. This is insured by the arrangement represented in the diagram. *P* is the projection lamp, throwing the light on the mirrors, *SS*, the rays being reflected to the model *M*. *A* is the camera. By means of a light filter, inserted in the projection apparatus, the light is graded so that the illumination decreases in intensity gradually from the left to the right, the model being illuminated so as to have the foremost parts struck by the brightest and the back parts by the darkest portions (point *a* bright, point *b* dark).

This gradation of light, which is noted on the model rather distinctly in the direction of the arrows, is so modified by the different inclination of the surfaces on which it is distributed, as to be hardly recognizable from the photographic camera. A view obtained with a similar illumination will therefore by no means reproduce the most salient portions as the most opaque; this would, by the way, not be obtained if the model were uniformly illuminated with white light. The coloring of the model, as a matter of course, would also have its influence on the plate, so as to give values quite independent of the height of the points in question.

Now, if after the exposure of this first plate, the gradation filter in the projection lamp be inverted so as to have the most transparent portion replaced by the darkest, and *vice versa*, the luminous intensity on the model will augment from the front toward the back. After a second exposure is made with this new illumination, no further views will be necessary. The transposition of the plate and the light filters is effected automatically

by shifting a slide, both exposures thus being made readily within one second.

After the plates are developed, the gradation of the two views is seen to be lost almost entirely, while the coloring of the model is visible in the same way on either of the views. If one of these views be printed as a diapositive and superposed on the other negative, a composite picture will be produced, which accurately corresponds to the conditions above outlined; in fact, any projecting parts in the model will be most strongly covered, while the back parts are represented by the most transparent portions, regardless of the color of the original. This remarkable result is due to the following facts:

Any difference of inclination of the various surfaces as well as of the color will result in a given modification of the graduated illumination. As both of these causes remain unaltered during the time the two views are taken, they will exert a prejudicial effect on the two views, practically identical in both cases. One of the views being printed as a positive, the values corresponding to the negative are inverted. As this positive is superposed on the other negative, any effects of color, etc., are present in the two photographs in an opposite sense; they will therefore compensate and neutralize each other. As, on the other hand, the gradation was opposite in the two negatives, it will be once more inverted by the positive, so as to behave similarly in the two plates superposed, the effects on either of them being added to one another.

If therefore a layer of chromium gelatine be exposed to the action of light, under a similar composite picture, a subsequent development in acidulated water will result in a plastically correct reproduction of the model.

The relief presented herewith was produced after life by this purely photo-chemical process in the physical department of the Urania, after some theoretical experiments in the Charlottenburg Technical High School, made with the assistance of Prof. Miethe, had borne out the correctness of the process. These reliefs, the height of which allows of rather considerable size, may be transformed at will as to all their dimensions, by means, for instance, of the Dedrick Wyon relief-copying machine. The results so far obtained are the more remarkable as they represent mere laboratory tests.

THE TRANSFORMATION OF THE GRAND CAÑON INTO A NATIONAL PARK.

BY C. H. GIBTHER.

With the foresight and liberality that have characterized our government from the first, the Grand cañon of the Colorado River in Arizona will be added to the national reserves, and placed under the care and custody of the government. Government surveyors have about completed a survey of a section of the cañon. This is only part of the work laid out by the United States Geological Survey, which has ordered a thorough survey of the entire San Francisco forest reserve. The best part of this wonderful Arizona gorge is within the reserve. It is given out that the United States officials have decided that it is time America's grandest and most awe-inspiring scenery be placed under government supervision. The work will require almost a year to complete, having been in progress about two years up to this time. The present section, upon which work is progressing, extends about fifteen miles east and west of Bright Angel Trail, on the south rim of the cañon, extending east to Grand View. Mr. Charles D. Walcott, who is at the head of the United States Geological Survey, has direct charge of the work. The first survey was made by Mr. John W. Powell, Mr. Walcott's predecessor, whose lamented death occurred while he was director of the United States Bureau of American Ethnology.

The work in hand has progressed far enough for the party to ascertain that many of the cañon's altitudes and measurements are incorrect; but the changes will be found to add to rather than detract from the grand measurements.

To the geologist the cañon offers an ever-increasing and endless field for study. Its mysteries are many, and within its walls it contains deposits that belong to almost every known geological age.

To the sightseer and lover of the tremendous and fearful in nature, there is nothing in the world that has equal claim to notice, for undoubtedly it is the most wondrous and gorgeous scenic field in the world.

The government will endeavor to spread a knowledge of this great reserve, in order to tempt travel to it, for no words, nor pictures, nor comparisons are vivid enough to convey even slight suggestions of its marvels. Obstacles in the way of reaching the rim of the cañon will be removed as rapidly as possible, the first step being a grant to the Santa Fé Railroad to build a line right up to the edge of the rim, the terminus of the railroad being Bright Angel Trail.

A great hotel has been erected at Bright Angel Trail, and visitors to the cañon at this point need not, as heretofore, take a hurried walk along the rim, cast frightened glances into the abyss, and hurry away to catch the returning stage or suffer the inconvenience of lying on the ground over night. The name "Bright Angel Trail" is appropriate and suggestive, for without wings the journey into those fearful depths could never be made. It sickens most beholders even to think of trying the descent, looking into the tremendous gorges, to say nothing of attempting to find a foothold on their precipitous sides.

A few adventurous spirits have tried to go through the cañon by boat, but only Major J. W. Powell and his daring party of adventurers lived to tell their experiences. For miles the river slips between walls of naked rock worn smooth to their tops by countless years of warfare with the elements. The walls sweep down to the water's edge, and a swimmer in those flashing currents could find no ledge or projection to stay his swift destruction.

Major Powell finally emerged from the cañon, minus two boats and four men. His narrative of his escapes and struggles pictures one of the most desperate undertakings ever essayed by man. The place seems to have a fascination for many beholders, like that of Niagara Falls, which tempts persons of peculiar temperaments to rush over the brink with the green waters. Several lives have been lost in the endeavor to emulate Major Powell's feat, but not one attempt has resulted successfully, except one expedition headed by a man named Stanton. Some of his party were crazed by their fearful struggles and the awesome sights, while others were rendered physical wrecks by their desperate and sustained efforts.

To the average person the descent of the old Hance trail offers plenty of excitement, and he is willing to leave more dangerous routes to sure-footed surveyors or old-time mountainmen. In the early days this was the only descent to the river for a distance of 300 miles; and it remains the safest and shortest to this day. For the first two miles of the descent, it is a sort of Jacob's Ladder down a nearly uniform decline. At the end of the two miles a slope is reached known as the first level. This is 2,500 feet below the rim of the cañon. Hance's rock cabin, a rude shelter, fashioned by piling bowlders together so as to form a sort of walled inclosure, over the top of which sticks and brush have been collected along the trail and carried with much labor to the spot, is located a short distance beyond, or below, the first level. This cabin is a famous landmark in the Southwest. It is the plan of the government to allow it to remain just as it is at present, for the sake of old associations.

After leaving the Hance cabin the explorer plunges down a steel trail, that leads past walls of red and dark-brown sandstone. Lizards and horned toads scramble across the path, but all about is silent save the ever-increasing roar of the torrent beneath. At the foot of a detached and slanting cliff 500 feet high a solitary Indian grave is encountered, with some pottery scattered around. Here also is the gigantic niche named the Temple of Seti by the painter Thomas Moran. From this point the descent must be made with the utmost care. Horses are abandoned, and the tourist lowers himself into the abyss. Sheer descents are found, which require the use of ropes, and at the last there is a drop of 40 feet, each person being swung over clinging to a rope, and supporting himself as much as he may by digging his feet into the side of the cliff as he slowly sinks past. The foot of this cliff is near the edge of the river, a narrow sandy strip intervening. The water is oily in appearance, and darts with the swiftness of an arrow past the little beach. A gigantic belt a hundred yards in width, moving with lightning speed, is an apt but inadequate comparison with the river. There is no foam, no eddies, no whirlpools, no rapids, but a resistless, onward rush of the whole body of the stream.

Huge trees are tossed about like corks, enormous stones are rolled and crushed together with a sound like thunder, where the water edges into the foot of some dizzy cliff, thousands of tons of stone crash into the water at intervals, only to be jostled and rolled away by the irresistible current.

At many points in the course of the stream through the Cañon there are waterfalls of enormous height. The river drops over cliffs hundreds of feet high, apparently into the depths of the earth, nothing being visible but a mist and spray, but there is audible such a terrifying roar and rumble as suggests titanic forces at work. A mile or so below the river emerges, having hewn for itself a passage through the living rock.

Guides licensed by the government are at the service of tourists, of whom many are women. These guides are men who are familiar with the cañon, and for a small fee escort parties or individuals to the most interesting places, furnishing horses and equipment.

The experiments made by Prof. Vladimir de Nicolaïeve prove the existence of an electric field in the interior of insulators immersed in conductors of electricity. In accordance with Prof. Cohn's views, this field is limited by the contact surface between the insulator and the electrolyte, while its forces show the properties of internal forces. (Physikalische Zeitschr. No. 8, April 15, 1904.)

Engineering Notes.

Some interesting tests are being made on the railroad between Voiron and Saint Béron in France with ferro-concrete in lieu of wooden railroad ties, to ascertain the comparative initial and maintenance cost, efficiency, and durability of these two systems. This track is 3 feet 3 inches gage, and the ties are 3.9 feet long by 7 inches wide and 5½ inches deep. They weigh 23 pounds each, and cost approximately 90 cents each. The concrete used is composed in the proportion of 33 kilogrammes of cement to 40 liters of sand, and the reinforcement of steel bars weighs 8.4 kilogrammes per tie. Under the most unfavorable conditions, it is even considered that the first cost of the ferro-concrete ties will not exceed that of good oak ties more than in the proportion of 5 to 3, while it will be four or five times as durable.

In connection with the new scheme inaugurated by the British Admiralty for the training of artificers for the navy, two obsolete battleships have been converted into floating workshops replete with modern machinery. The two vessels selected for this purpose are the "Bellerophon" and the "Téméraire." The conning tower of the former vessel has been removed, together with the after funnel and the after boilers. In their place there has been erected a corrugated iron structure, 200 feet in length by 50 feet wide and 21 feet in height, comprising a machine shop fitted with various machines and lathes. The boiler room has been converted into a blacksmith's shop, and contains sixteen forges and anvils, a motor hammer, and coppersmith's fires. In the case of the "Téméraire," the main deck is occupied with plumbers' and fitters' workshops containing all the latest necessary machinery, while on the same deck is also an electrical department. In the forward barbette the dynamos for generating the light and supplying the power for the various motors are installed. These vessels are to be moored in the harbor, and about one hundred boys will be accommodated upon each ship.

An interesting application of the steam-heating system so extensively adopted in this country is in course of experiment in Dresden. In that city the Saxon government has established a huge central station, and from this the heat is distributed among a number of the municipal buildings, including the Royal Opera House, the Picture Gallery, Zwinger Museum, the Hofkirche, and Royal Palace. The edifices are all situated near the central heating station, which stands upon the banks of the river Elbe, whereby an adequate supply of water is always available. The station contains ten generators, producing over 55,000 pounds of steam per hour. The steam is distributed to the various public buildings by means of steam pipes laid beneath the streets. But this ingenious heating system is also utilized to fulfill a dual purpose—the generating of electricity for lighting the various edifices. The heat is generated and distributed during the early morning, when the electric supply is not required, and once the buildings are thoroughly heated, it requires but very little pressure to maintain the temperature desired throughout the day. Consequently, this arrangement enables the steam power generated during the later part of the day to drive the electric installation and maintain the pressure required. This combined heating and electric lighting system has proved highly successful and economical, and its extension to other towns in Saxony is contemplated.

The results of the inspection of the refloated British submarine "A 1," which was sunk by collision with the liner "Berwick Castle" off the Isle of Wight, has enabled a tangible hypothesis to be obtained concerning how the crew met their death. Examination of the submarine in drydock showed that the liner struck the submerged craft on the conning tower about 15 feet below the surface. The optical tube was bent to port, a ventilator broken, and the conning tower dented. The actual rent in the hull of the vessel, however, was very small. Capt. Bacon, who is in charge of the submarine flotilla of the British navy, upon examination found blood marks on the grating of the conning tower, just underneath the position of the officer in charge of the vessel, while other similar marks were found in other parts of the craft. These appear to show that the crew within the submarine were all stunned by the force of impact arising from the collision, and were drowned without recovering consciousness. This theory is substantiated by the fact that the leak could have easily been stopped from within, and the submarine brought to the surface, by blowing the ballast tanks, whereas none of the latter were blown. Every member of the crew was found at his appointed position. All the plates around the conning tower were found to be intact, and the vessel is but slightly damaged. The craft will be overhauled, and will soon be ready for service once more.

Correspondence.

Locomotive Superheaters.

To the Editor of the SCIENTIFIC AMERICAN:

In a description of a superheater for locomotive boilers, which appeared in your impression of June 4 (page 443), we are informed that superheaters for locomotives were not designed before 1898.

In the year 1863 several freight engines were built for the Northern Railway of France, having tubular superheaters in the smokestack. Drawings of these engines will be found in Colburn's "Locomotive Engineering and Mechanism of Railways."

Some time prior to the year 1860, Sharp, Stewart & Co., of Manchester, England, built a locomotive for the Egyptian government railway, which had a superheater. The upper part of the smokebox was partitioned off, forming a perforated chamber, through which the steam was passed on its way to the cylinders. Drawings of this engine were published in Clark and Colburn's "Recent Practice in the Locomotive Engine." HERBERT T. WALKER.

Mt. Vernon, N. Y., June 3, 1904.

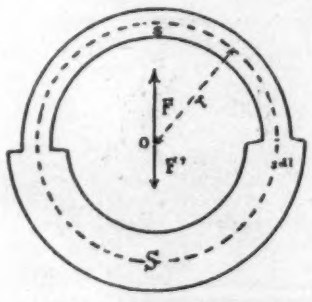
Another Paradox.

To the Editor of the SCIENTIFIC AMERICAN:

In the SCIENTIFIC AMERICAN of April 23 I read an article entitled "An Interesting Paradox," by Daniel F. Comstock, who leaves to the insight of the reader the discovery of the fallacy in the system of perpetual motion.

I propose another interesting paradox:

A circular closed tube, one-half of the section represented by S, and other half of the section represented by s, is filled with water, circulated by a pump or other engine connected with the tube.



Assume the velocities of water through the sections s and S to be respectively V and v.

Thus $Sv = sV$.

The centrifugal force of water through the section S on a length dl is:

$$\frac{S\,dl\,v^2}{g\,r} = dF$$

and through the section s this force is:

$$\frac{s\,dl\,V^2}{g\,r} = dF$$

$$F = F'\,S/s$$

Hence, the centrifugal force of the side s being greater than of the side S, an interior force moves the center of gravity of the system, pump and tube, without any exterior force. EMILIO HERRERA,

Officer of Spanish Royal Engineers.

Melilla, Morocco.

A Civic Museum for New York.

To the Editor of the SCIENTIFIC AMERICAN:

A sub-committee of the Andrew H. Green Memorial Association, having in charge the question of determination of the form of a memorial to the man whose name is more intimately associated with the creation of the present city of New York than any other, has received a number of proposals, some of which are of elaborate description, while others take the more modest form of a simple statue. But among the suggestions one stands apart by reason of its appropriateness and public usefulness, and this is a plan for a Civic Museum for New York.

The model for such a museum is furnished by the Museum Carnavalet in Paris, which, although one of the lesser museums in that city of great museums, has long been one of the most interesting collections in the world. It illustrates, in a very thorough degree, every stage of the growth of Paris, and its contents include a wonderful collection of objects of art and historic interest.

The material available for such a museum in New York would, of course, be very different from that available in the case of Paris, with its history of centuries; but it would, nevertheless, be of the deepest interest, and of an interest that must increase with each year of growth. The scope of the proposed museum would be very different from that of an historical museum or an art collection, although it would have some of the qualities of both. Its primary object would be to illustrate New York as a city; to gather up matters of historic interest having civic significance, to preserve models, plans, proposals, and studies for public improvements; and to preserve matters which, familiar enough to living citizens as every-day affairs in metropolitan life, would soon pass away and be forgotten without some recognized place of deposit and preservation.

Civic development, and more particularly in relation to its artistic development, is a subject in great popular favor at the present time. Many proposals and efforts are being made in this direction, not a few of which are early lost to view because they are not immediately put into execution. A positive service to the community would be afforded by the creation of a museum where such studies could be preserved, and where they might be available for future students working along similar lines. The proposed Civic Museum for New York would fill this public need, and it might also serve as a center where much material now absolutely unavailable could be placed.

The Civic Museum would occupy a field peculiarly its own, and would add greatly to the museum resources of New York. No such institution exists at present in America, and both for distinctiveness and usefulness this project merits the favorable consideration of the committee having the Green memorial in charge. It is a plan that must interest many New Yorkers, apart from whatever interest they might have in Mr. Green, and the museum once started, must command the support of the entire community.

New York, June 10, 1904. BARR FERREE.

New Laboratory Buildings for the National Department of Agriculture.

BY E. W. ALLEN.

Plans are being completed for a series of buildings for the Department of Agriculture at Washington, and it is expected that the work of construction will be commenced this summer. The present buildings were built when the department was much smaller, and before it had developed into the most extensive institution for agricultural research to be found in the world. The growth of its laboratories has necessitated the renting of several large buildings near the department grounds, and the conversion of numerous dwelling houses into laboratories. The department this year will expend nearly $40,000 for rent in Washington, and even then will secure only poorly adapted quarters.

In 1902 Congress was asked to appropriate $2,500,000 for new buildings, to consist of a central administration building with laboratory wings on either side. The latter were to be connected with the administration building by covered passages, the whole presenting an imposing front of about 750 feet, with a court in rear. Congress reduced the appropriation to $1,500,000, and with this amount the two laboratory wings will now be put up, leaving the completion of the scheme until a further appropriation is obtained.

The location selected is in rear of the present main building, and facing the 900-foot parkway which is projected from the Capitol to the Washington Monument. It will necessitate the removal of several frame structures, used for museum, office, and storage purposes, but for the most part the present buildings can remain until the administration building is completed.

The laboratory wings will be L-shaped, each having a frontage of 256 feet, and the ell extending 100 feet to the rear. They will be separated by an opening of 220 feet, reserved for the administration building. Each wing will be four stories in height above a high basement and a sub-basement. The depth from front to rear will be about 60 feet, the space on each floor being divided by a 12-foot central corridor, so as to give a series of units about 20 by 22 feet on either side. The windows and doors are so arranged that these rooms can be divided by temporary partitions if desired.

The construction will be fireproof and of the most modern character throughout. The permanent partitions at right angles to the corridors will be of brick and hollow, leaving clear spaces extending from the sub-basement to the attic. In these will be carried the hot-air flues for heating and the flues for ventilation. Each room will have two hot-air flues, two ventilating flues, and two flues for carrying off the fumes from hoods.

The buildings will be heated by indirect radiation, the heat being supplied by a power plant located in a special building. The system adopted is quite complicated, but will allow absolute control of the temperature of each room independently of any other room, and will supply filtered and moistened air. Each laboratory will be supplied with hot and cold water, distilled water, gas, compressed air, suction, live steam, and electricity, from machinery located in the power house, and the apparatus for grinding and other purposes will be run by electric power. The supply pipes will be carried in pipe shafts, which will make the risers accessible at any point, and in installing these provision will be made for supplying every room in the two buildings, so that they may be converted into laboratories whenever desired. All piping will be exposed, the laterals being suspended from the ceiling of the room below and brought up through the floor at desired points. A lead-lined soil pipe in each of the hollow partitions will carry off the waste.

Although a great variety of laboratory work will be conducted in these buildings, the construction will be uniform throughout, and will not take into account the special needs of laboratories for chemical analysis, soil work, botanical investigation, and the like. The facilities provided in all parts of the two wings will be so complete that the adapting of a series of rooms to a particular kind of work will be merely a matter of installing equipment and making connections with the supply pipes. This plan will allow changes in the assignment of quarters to be made readily in future, as the needs in a particular line of work grow.

The exterior walls will be of solid masonry, either marble or granite. The laboratory floors will be of concrete, with maple in the offices, and the walls and ceilings will be of cement plaster painted with enamel paint. The total floor space provided by each wing will be 80,000 square feet, including the corridors, leaving about 55,000 square feet in each building available for laboratory and office rooms. The architects are Rankin, Kellogg & Crane, of Philadelphia; and the supervising engineer is Major John S. Sewell, of the War Department.

Electrolytic Method of Estimating Gold.

At a recent meeting of the Faraday Society, Dr. F. M. Perkins and Mr. W. C. Prebble gave the results of researches to arrive at an electrolytic method of estimating gold which should be perfectly accurate, and yet far more rapid than the ordinary double cyanide method which the authors, differing from Classen, consider inordinately long, even in hot solutions. Solutions of sodium thiosulphate, cyanide, sodium sulphide, potassium thiocyanate, and ammonium thiocyanate were all tried and the results compared. The first-named was useless; of the others—which are all accurate—the thiocyanates gave the best results and the ammonium salt was better than the potassium. With currents of 0.2 ampere per square dcm., the deposition of 0.05 to 0.08 gramme of gold was complete in 5 or 6 hours. With a current of 0.4 to 0.5 ampere, 1.5 to 2 hours sufficed. The presence of a little persulphate considerably reduced the voltage required. Experiments were also made to determine the best method of removing the deposited gold. Chlorine or bromine water was satisfactory, but slow; aqua regia was risky; the authors recommended a 3 per cent solution of potassium cyanide containing a little hydrogen peroxide or a persulphate. One or two minutes then sufficed to remove the gold.

The Bound Volume of the Scientific American Building Monthly.

Volume XXXVII of the SCIENTIFIC AMERICAN Building Monthly, comprising the numbers for January to June, 1904, is now ready for delivery. This sumptuously illustrated book contains 211 illustrations, 6 covers in tint, and 132 pages. There are 84 large pages of original photographs and plans of dwelling houses of all costs, forming a veritable encyclopedia of contemporary domestic architecture. The special features of the present volume include "Whitehall," the house of H. M. Flagler, Esq., at Palm Beach, Fla.; "Faulkner Farms," the estate of Mrs. Charles F. Sprague at Brookline, Mass.; the house of E. J. Berwind, Esq., at Newport, R. I.; "Grey Craig," the magnificent castle of J. Mitchell Clark, Esq., at Newport; and "Blairsden," the superb country seat of C. Ledyard Blair, Esq., at Bernardsville, N. J. There are editorial articles on "Some Home Builders and What They Did;" "House Education;" "The Interest of Houses;" "The House of the Future;" "The Small House;" "The Association of Houses." The numerous departments constitute a "review of reviews" summary of current comment, suggestion and help in all matters relating to the construction of the home, its decoration, equipment, and use. The price of the bound volume is $2, postage paid.

The Current Supplement.

The current SUPPLEMENT, No. 1486, opens with an excellently illustrated and well-written account by Emile Guarini on "Typical Automatic Weighing Machines." John E. Thornycroft, England's veteran engine builder, discusses the advantages of gas and oil engines for marine propulsion. "A Novel Four-Piece Mechanism" is the title of an article by the English correspondent of the SCIENTIFIC AMERICAN. "The Telefunken Ondometer for the Measurement of Wireless Telegraphic Waves" is described in full. Prof. Vivian Lewes, whose work on the chemistry of illuminating gases is well known throughout the world, publishes an instructive essay on reducing the candle-power of gas. Walter Fewkes' preliminary report on an archeological trip to the West Indies is concluded. "How Gold Leaf is Beaten" is fully described.

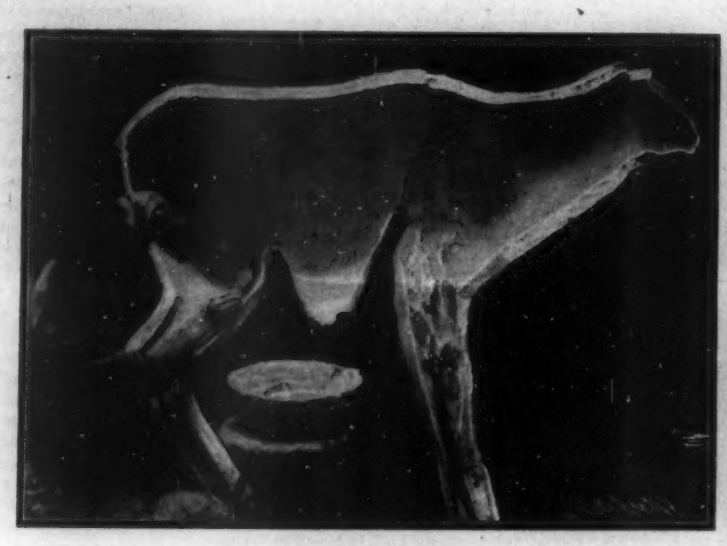
MODELING ANIMALS IN CLAY. THE PASSING OF TAXIDERMY.

BY WALTER L. BEASLEY

The American Museum of Natural History, in the Department of Preparation, has adopted what is considered the most advanced and artistic method of reproducing wild animal life for exhibition purposes so far devised. In fact, it is almost revolutionary in its way, since it involved a radical departure from the old, stereotyped rules of taxidermy. In the new process, the animal's body is modeled entirely in clay, and is given the same careful treatment as would be expended by a sculptor on the fashioning of a human face or figure. Consequently, the finished study is not governed or produced by traditional regulations, but more by the ability of the artist to transfer to the clay mount his ideal conception of the animal, as gleaned from actual observation and by comparison with the best class of reproductions. The art has passed beyond the ordinary operations of a mere mechanic. Its successful worker must be a sculptor, endowed with creative talent. The usual conventional methods have been discarded, and more satisfactory and up-to-date ones substituted. These are destined to meet the approval and be received with delight by all ardent lovers of animal portraiture. Practitioners of the old school may be a bit skeptical and slow to acknowledge the merits of the new sculpturing process, but ultimately they cannot fail to see its marked advantages.

From the recent field work of the various animal explorers in remote regions of Siberia, Arctic America, British Columbia, and Mexico, an extensive collection of rare skins has been obtained, many of them new species hitherto unknown. These when mounted are intended for the new unopened Mammal Hall, and when installed will represent the largest display of wild animal life in the United States.

The First Stage. Applying the Clay to the Frame.

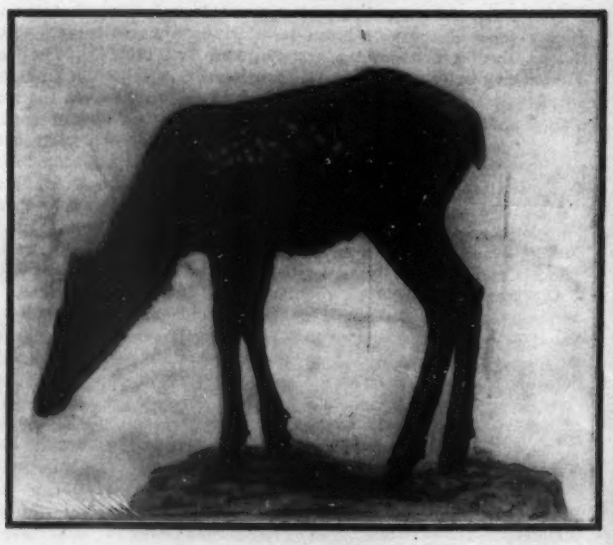


Preparing the Elk Mold for a Cast.

Mr. Clark Modeling the Legs of an Elk.

Fitting the Skin Over the Figure.

The Miniature Sketch in Clay.



A Young Elk, Completed.

MODELING ANIMALS IN CLAY. THE PASSING OF TAXIDERMY.

In the Department of Preparation Mr. J. F. Clark is producing some beautiful and artistic animal studies, notably a large group of British Columbia and Washington elk (*Cervus canadensis occidentalis*), having five figures. They will be represented in characteristic attitudes—at rest, feeding, and on the lookout.

(*Continued on page* 498.)

THE SECOND MOTOR-BOAT RACE.

The second of the American Power Boat Association's races took place on the Hudson River Saturday, June 11. As a social event the affair was very successful; as a demonstration of the efficiency and speed of the automobile boat, not quite so much can be said. There were sixteen starters, and of these at least four were disabled during the races.

W. K. Vanderbilt's "Hard Boiled Egg," which did not compete in the previous race, appeared on this day and was steered throughout the races by her owner. The craft is fitted with the Mors engine of 60 horse-power which Mr. Vanderbilt has had transferred from one of his automobiles. The boat is 35 feet on the water line, and 40 feet over all. The builder, Robert Jacob, acted as Mr. Vanderbilt's assistant. The "Hard Boiled Egg" competed in the class for automobile boats over a 24-knot course. She finished third, the "F. I. A. T. No. I." and the "Shooting Star" finishing ahead of her. The former made a good showing, though not developing the speed that had been looked for. The "F. I. A. T. No. I." is 35 feet over all, and 30 feet on the water line. She derives her power from a F. I. A. T. engine of 35.13 horse-power. Her owner, C. H. Tangeman, steered her throughout the race. The "Shooting Star," a newcomer, which finished second, is owned by H. A. Lozier, Jr., and has a Lozier engine of 27.14 horse-power.

Another boat that made her maiden appearance on this day was the "Alert," owned by George W. Childs Drexel, of Philadelphia. She was driven by a Speedway six-cylinder engine, and was matched against the "Japansky" and "The Standard" over a course of 32 nautical miles. The "Alert" slipped a clutch, however, on the first round and was thereby incapacitated temporarily. The "Japansky," with a racing length of 70.35 feet, owned by J. H. Waldorf and fitted with a "Speedway" engine of 40.99 horse-power, was easily defeated by the "Standard" with a racing length of 86.05 feet, owned by C. C. Riotti, which has a 110 horse-power engine. The "Standard" made an excellent showing and covered the course in 1:41:27. Frank Seaman's "Water Lily," equipped with a Speedway engine of about 40 horse-power, and 47 feet 5 inches over all, went over the course in the wrong class and therefore made no record. She also had temporary trouble with her engine.

In the cabin class the "Queen Bess," owned by R. N. Stevens, fitted with a Standard engine, finished ahead of all the others; the "Regina," owned by D. L. Clayton and having a Speedway engine, coming in second. The other boats in this class were the "Senta," owned by F. G. Mead, with a Howard engine; the "Aletes II.," owned by R. C. Fisher, with a Standard engine, and the "Getty," owned by Morris Vail, with a Howard engine.

The "Nada," owner C. A. Godschalk, with her 3½ horse Giant engine, made excellent time over the 12-mile course, finishing in 1:24:17, her only competitor being the "Kotic," owned by C. A. Paine. In the 16-mile event the "San Toy," owned by W. H. Barrows, was the winner, with the "Ardis," R. M. Haddock owner, second. The "Kaa," J. J. Amory's boat, was also in this class, but did not finish.

The summary of the races is given herewith:

CLASSES B, C, D.

Course 16 nautical miles. Start, 2.35 P. M.

Boat and Owner	Finish. H. M. S.	Elapsed Time. H. M. S.	Corre'd Time. H. M. S.
"Queen Bess," R. N. Stevens	4 34 35	1 59 35	1 42 10
"Regina," D. L. Clayton	4 37 30	2 02 30	1 47 03
"Senta," F. G. Mead	4 46 07	2 11 07	1 51 41
"Aletes II." R. C. Fisher	4 51 29	2 16 29	1 54 29
"Getty," Morris Vail	5 15 46	2 40 46	2 54 11

The "Queen Bess" was winner, with the "Regina" second and the "Senta" third.

CLASSES H, I, AND J.

Sixteen nautical miles. Start 2.40 P. M.

"San Toy," W. H. Barrows	4 14 04	1 34 04	1 33 01
"Ardis," R. M. Haddock	4 14 34	1 34 34	1 34 34
"Kaa," J. J. Amory	Did not finish.		

The "San Toy" was winner.

CLASSES E AND L.

Twelve nautical miles. Start 2.45 P. M.

Boat and Owner.	Finish H. M. S.	Elapsed Time. H. M. S.	Corre'd Time. H. M. S.
"Nada," C. A. Godschalk	4 09 37	1 24 37	1 24 17
"Kotic," C. A. Paine	Did not finish.		

CLASSES P, Q, AND R.

Automobile boats, 32 nautical miles. Start 2.50 P. M.

"Standard," C. C. Riotto	4 31 27	1 41 27	1 41 27
"Japansky," J. H. Waldorf	5 11 28	2 21 28	2 19 03
"Alert," G. W. C. Drexel	Did not finish.		

The "Standard" was winner.

CLASSES S, T, AND V.

Automobile boats, 24 nautical miles. Start 2.55 P. M.

"F. I. A. T. No. 1," C. H. Tangeman	4 26 07	1 31 07	1 30 20
"Shooting Star," H. A. Lozier, Jr.	4 27 01	1 32 01	1 30 55
"Hard Boiled Egg," W. K. Vanderbilt	4 29 21	1 37 21	1 37 21
"Water Lily," Frank Seaman	Did not start in her class.		

The "F. I. A. T." was winner, the "Shooting Star" second, and "Hard Boiled Egg" third.

W. H. Barrows' "San Toy."

George W. Childs Drexel's "Alert."

C. C. Riotti's "Standard."

W. K. Vanderbilt, Jr.'s "Hard Boiled Egg."

H. A. Lozier, Jr.'s "Shooting Star."

THE SECOND MOTOR-BOAT RACE.

Soap from the Fruit of a Tree.

The Leicester Hosiery Trade Journal contains an account of an enterprise in Algeria to manufacture natural soap on a large scale from a tree known as *Sapindus utilis*. This plant, which has long been known in Japan, China, and India, bears a fruit of about the size of a horse-chestnut, smooth and round. The color varies from a yellowish green to brown. The inner part is of a dark color and has an oily kernel. The tree bears fruit in its sixth year and yields from 55 to 220 pounds of fruit, which can easily be harvested in the fall. By using water or alcohol the saponaceous ingredient of the fruit is extracted. The cost of production is said to be small and the soap, on account of possessing no alkaline qualities, is claimed to be superior to the ordinary soap of commerce.

In a recent communication from United States Consul-General Bellows, at Yokohama, the attention of American manufacturers and inventors is called to the fact that those doing business in Japan are threatened with a serious state of affairs owing to the actions of certain persons in that country who have been lately registering a number of the most famous American trade marks. This has put to a standstill the business covered by such trade marks except when purchased through the persons who have wrongfully registered them.

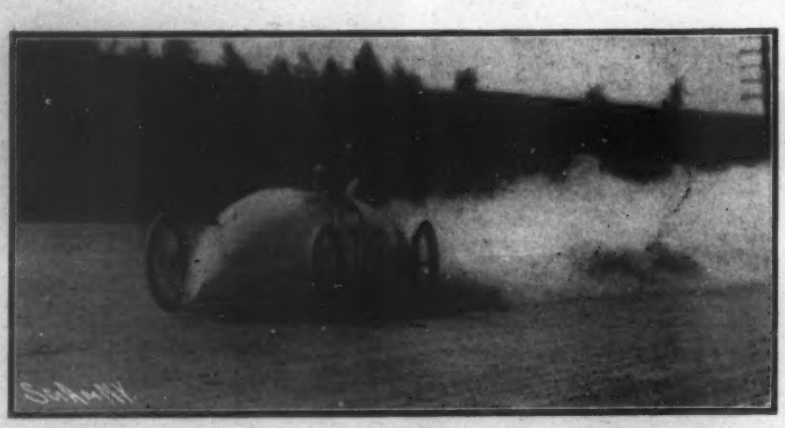
MODELING ANIMALS IN CLAY. THE PASSING OF TAXIDERMY.

(*Continued from page* 496.)

The size of the group will be 22 feet by 11 feet. Mr. Clark has shown by his work that he is a painstaking and artistic craftsman in clay, and in a thoroughly realistic way depicts the leading traits and appearance of the animal in hand. The result is that the finished model is full of vigor and has a life-like aspect, which is a striking advance over the stiff, soulless examples hitherto turned out by the old manner. In a recent interview, Mr. Clark outlined to the writer his working plans, and just how he managed to evolve from the remnants of the fallen creature his excellent reproductions.

Some of the striking illustrations in the various stages of this interesting process, with the artist at work upon his creations, are here shown for the first time. The mounting of large animals has become an art, and the modern and advanced taxidermist is today an animal sculptor. The passing of taxidermy, with its primitive stuffing, is a foregone conclusion. The animal is so skillfully imitated in clay in shape, contour of the body, muscular development, tapering of the limbs, that it seems to the casual observer for a moment that he has been spirited away to the forest and surrounded by the creatures themselves. The immediate superiority of producing animals in clay lies in the fact that the minutest detail in proportion, characteristic position most commonly assumed, all the gradations in anatomy, can be worked up and brought almost to the desired state, and, after the skin is temporarily tried on, the figure can be immediately altered at such points as improvements are necessary before the skin is permanently stitched in place. This was not possible under the old ways; for, after having reached what was considered a perfect shape, the skin was sewed on the hard plaster covering the limbs, which, being set and rigid, would not allow any change in the position or attitude of the animal. Wrong measurements or faulty construction in the finished model demanded laborious chiseling away of the plaster; while anything like giving a new and different pose meant total annihilation of the whole framework. These difficulties have been done away with in clay modeling. The old-time taxidermist, so to speak, might be fittingly designated as a mere mechanic, who, with tools, patterns, and prescribed regulations, produced a mounted specimen. Artistic and creative talent was drawn upon but slightly. In clay work the head and each limb can be repeatedly moved during the process of construction, with ease, yielding and bending to the touch and skill of the artist. Mr. Clark has brought into his work much close and original nature investigation, supplemented by pictorial studies obtained by the camera at the Zoological Park and elsewhere. Often, when out in parks or zoos, animals will, under varying conditions, assume a particularly striking pose. This is caught by the photograph, and afterward used in groups to good effect. With the old method the bones were used in the mount, and having heavy iron rods adjusted to the leg bones as supports, they were fastened to a center-board cut to the general outline of the animal, which might be called the backbone of the mount. Upon this center-board and legs were bound excelsior, as well as on the two iron rods that supported the skull. The excelsior was worked up to nearly the final shape, and when still very soft, common clay was smeared over about one-half an inch thick, which caused the skin to adhere to the substance. Only a little modeling from the outside could be accomplished. Everything had to be permanently fastened. There was much guesswork in construction, so much indeed that it could not be told how the animal would look until finished, and then it was impossible to change. In the modern method, while the clay modeling is progressing, the skin may be frequently tried on, and the sculptor may see how the animal will look when completed. Many sportsmen have mounted heads which they find are cracking and splitting. This is due to the clay used underneath the skin, which, after becoming dry, will shrink and crack, and since the skin is attached to the clay, it will necessarily have to give away, producing an ugly tear. Many a fine skin has been ruined in this way. In the new method there is no danger of anything like this occurring. The skin, after it is once on, is good for an indefinite length of time. After the animal is shot in the field or has died in the zoo, measurements are taken, such as total length, height, and circumference of the body. These are required to insure accurate calculations in the construction of the final mount.

With the skin, these figures, and the bones of the skull, legs, shoulder blades, and pelvis, which are saved from the animal, the modeler is ready to begin. First of all, the skin is treated with an application of salt immediately after it is taken from the animal. This acts as a preservative, and has a tendency to keep it for an unlimited period. It is further thinned down by a special knife and put into a soft and pliable state, so that in course of the preparatory stage it may be tried on frequently, to see if the figure with the skin on will compare well with nature. A miniature model in clay is the foundation for the intended creation. In this the characteristic attitude and general arrangement of the animals are worked out in detail as they will appear in a permanent large group. At various stages this is consulted, and compared with the work in progress. Clay is used for modeling the large figures, as this material has the advantage of being worked freely and quickly. A frame is made sufficiently strong to support the heavy clay, and to this is attached the bones and skull, put in position by the measurements taken. Then the clay is applied, and, with the bones as a fundamental guide, the anatomy and form are gradually worked out, at the same time always referring to the small model and many photographs from the live animal. The figure is modeled, of course, as the animal will be without the skin. This takes its respective place finally. After the clay model is completed, a plaster mold is made, from which durable and light casts are taken. These being assembled reproduce exactly the original clay model, iron rods being used as supports for the legs. After the cast has been obtained, the clay and bones are entirely discarded. The cast is allowed to dry, and is thereafter given two or three coats of shellac to make it waterproof. The skin, by this time, has had its final touches by the tanner, and is ready to be put on. Since it is moist, a paste of flour and glue is used. The seams having been sewn up, the skin is adjusted; such parts as the hoofs and ears being worked up at the very last with *papier maché*. The delicate modeling to be found around the eyes and mouth may be more satisfactorily represented by modeling from the outer surfaces of the skin, with the soft *papier maché* underneath. With a little color on the eyelids, etc., to give the natural tints, the animal is completed. Unlike the work of the animal painter on canvas, distance does not lend enchantment to the view. More than double the time is expended upon the preparation of a figure in clay than by the old method, but the finished results are correspondingly superior, being both a delight and pleasure to the eye of the general onlooker and the trained naturalist. Additional realism will be incorporated by installing some of the natural surroundings in the feeding grounds frequented by the animals when alive, such as willow twigs, moss, leaves, branches, etc. These have been especially secured by Dr. B. E. Dahlgren, head of the department, during a recent trip to this locality. Thus a veritable bit of transplanted forest from British Columbia and the Olympia Mountains will form the scenic feature of the group.



LOUIS ROSS MAKING A MILE A MINUTE ON HIS 20-HORSE-POWER STANLEY STEAMER.

Traction Engine for Tule Lands.

At the junction of the Sacramento River with the San Joaquin there are millions of acres of lands which are submerged in times of flood, but at ordinary stages the rivers are covered with rank and luxuriant vegetation. They are known as "tule" lands and are formed of a soil of exceeding richness and strength. Large amounts of capital and much engineering ability have been expended in surrounding certain portions of these lands with levees, high and broad, in order to reclaim them permanently from the inroads of the flood. When properly cultivated they produce enormous crops of grains, vegetables and fruit. Crops of 80 sacks of wheat have been gathered from a single acre. Mechanical aids to cultivate the extensive tracts are absolutely necessary, and the most powerful machinery is employed for that purpose. A new pattern of traction engine has been turned out by the Best Manufacturing Company, of San Leandro, Cal., designed for working on reclaimed land situated near Stockton. The soil is so deep and loose that it is impossible for a horse to travel across it, consequently only a traction engine could be employed and with wheels broad enough to support the heavy weight required. The soil is of about the consistency of heavily-packed snow.

This particular traction engine is of 110 horse-power. Its total weight is 18 tons, and each driving wheel is 8 feet in diameter, with a breadth of face of 5 feet. The leading wheel is 5 feet high with 45-inch face. Double engines, duplicates, afford the necessary power. The boilers are upright, combination type, and oil is the fuel used. The cab is tightly inclosed and provided with a blower to eject the clouds of dust which arise as the engine moves over the light soil. Without the blower the cab would not be habitable. The engine has a width of 16½ feet and a total length of 24 feet. Its speed is from 2½ to 3 miles an hour, and its general running capacity is from 80 to 100 acres a day. The first work to be done is in rolling over the "tules" and crushing the vegetation preparatory to clearing the lands. Afterward the engine will be employed in plowing, cultivating and harvesting. Generally speaking, the tule lands are level; but there are always considerable depressions in the surface beside gullies and exhausted sloughs. Over these uneven surfaces, the new type engine travels very satisfactorily, and it promises to prove a successful application of mechanical power to difficult agricultural conditions.

THE BOSTON AUTOMOBILE RACE.

Thousands of spectators witnessed the automobile races on the Readville track, in Boston, two weeks ago. The events were almost all of them exciting; and still, there were no accidents to the participants. The first of the series of races for the Boston Herald cup was won by H. L. Bowden in his Mercedes. Although he did not succeed in winning a prize, Louis Ross broke the 5-mile steam machine record with a Stanley by doing the distance in 5 minutes 33 3-5 seconds. His was, indeed, the most sensational performance of the day. His machine was of 20 horse-power, and was driven by two engines. The steam pressure of 1,000 pounds was so high that, in the endeavor to use it to the utmost advantage, serious leakages occurred, which prevented him from finishing in the 10-mile race. In a later race he broke his axle, and was thus again prevented from finishing. How terrific must have been the speed at which he was going is well shown in our illustration.

The Königliche Mechanisch-Technische Versuchsanstalt at Charlottenburg (in spite of its long name) is well worthy of a thorough inspection by Americans interested in this class of technical work and progress. This laboratory was founded in 1880, and its first work was to settle some disputed points on the quality of Portland cement. In 1882 its duties were extended to the testing of metals and other materials of construction. At the present time the Versuchsanstalt undertakes researches of general scientific interest, as well as making reports on the quality of goods submitted to it by any of the public departments or by private firms. In 1886 voluntary workers were for the first time admitted to the establishment. Such volunteers are young men who, having already a good knowledge of scientific work, wish to have the advantage of assisting in one or other of the important researches always in progress at the laboratories. They receive no pay for their services, and undertake to assist in the laboratories for a period of at least three months, and to work entirely under the direction of the permanent staff of the Versuchsanstalt. Students from the higher technical schools are also admitted to work in the laboratories at Charlottenburg, so that these serve for the instruction of students as well as for research.

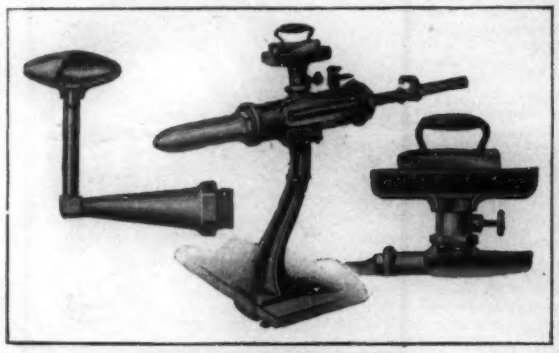
An institution on these broad lines might well be copied by some of the great teaching schools of the United States.

The report by the hydrographer of the Admiralty of the work performed during the year 1903 in the examination and charting of seas and coasts in various parts of the globe has been issued as a Parliamentary paper. It appears that eleven vessels were regularly engaged in the operations, and that during the year 344 rocks and shoals which were dangerous to navigation were reported. Of these, 40 were reported by surveying vessels, 21 by other of his Majesty's ships, 12 by various British and foreign vessels, 13 were discovered by vessels striking on them, and 245 were reported by colonial and foreign governments.

Patent Department

IRONING APPARATUS.

An apparatus has been invented by Mr. Robert Rutherford, of 101 Wabash Avenue, Montavilla, Ore., which is especially designed for ironing velvets, ribbons, ruffles, etc. The apparatus is very simple, and is arranged to be heated either by gas, steam, or electricity. In our illustration we show a form adapted for the use of gas,

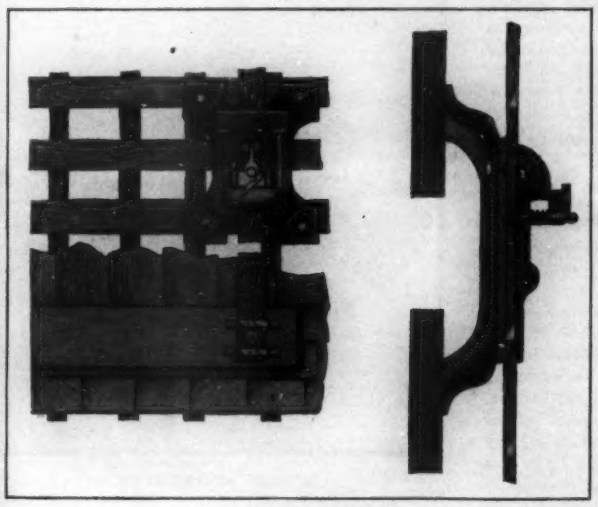


IMPROVED IRONING APPARATUS.

and also the steam attachment. The device comprises a stand which may be secured to the table by means of clamping screws. At the top of this stand is secured a tubular heating chamber, in the front end of which is screwed a tubular sad iron closed at its outer end, as shown. This sad iron may be of any desired form to suit different requirements. One special form is shown at the left of the main figure in our illustration. At the top of the heating chamber is a hollow stand on which a sad iron of the ordinary form may be heated. This stand and its connections are shown more clearly in the view at the right of the main figure. A valve controls the admission of heated air from the main chamber to this hollow stand. The heating chamber is heated by means of a Bunsen burner therein, the flame being supplied with fresh air through openings in each side of the chamber. When steam is used for heating the sad iron, it is admitted through a valve shown at the top of the chamber near the rear. If electricity is to be used, a coil of fine heating wire may be placed in the heating chamber and connected with wires extending through a plug threaded into the rear of the chamber. The apparatus is used in the ordinary way, the sad iron remaining stationary, of course, and the goods to be ironed being drawn over it.

SHINGLE GAGE.

A patent has recently been granted to Mr. James Dinwiddie, of Fayetteville, Ark., for an improved shingle gage which is pictured in the accompanying illustration. The device is simple and inexpensive, and by its use the several courses of shingles will have



SHINGLE GAGE.

their butt ends in perfectly straight lines and parallel throughout the extent of the roof. The device is so constructed that it may be quickly adjusted for progressing courses and for different lengths to be exposed to the weather. Two or more fastening devices, such as the one we illustrate, are fastened to the sheathing of the roof. Each holding device comprises a baseplate secured at the corners by thumb screws. Mounted on the base-plate is a guide-plate which has pivotal connection with the base-plate, and has a limited lateral movement thereon. Mounted to slide transversely on the guide-plate is a second plate which carries a dog adapted to engage one of a set of slots or notches formed in a bar which passes between this plate and the guide-plate. This bar carries at its lower end the gage-bar. A spring-pressed pin bears against the end of the dog and holds it firmly in engagement with its slot. These slots in the bar are ranged in sets of three, each one of a set being differently placed, and by sliding the plate laterally, the dog may be brought into engagement with different slots of a set as desired. Means are provided for locking the plate in position after it has been laterally adjusted.

The operation of the device is obvious. The shingles are nailed in place against the gage-bar and then the gage is moved up for the next course. The end walls of the slots in the bars which pass through the holders are inclined so as to raise the dog when they are moved upward for the different courses. When it is desired to raise the dog to bring it into engagement with a different slot, the spring-pressed pin is first raised and held in its position by means of a latch which fits under the head of the pin. It is obvious that with an apparatus of this character shingles may be very rapidly laid, as the shingler is not required to mark off chalk lines for the butts of the shingles, or to use gage boards as is sometimes done, the boards being nailed to the shingles. This, it may be stated, is objectionable, because the nails may leave holes which would cause leaks.

IMPROVED BUCKLE.

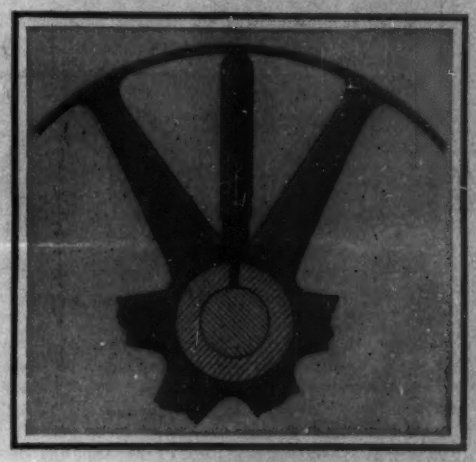
The common type of buckle now in use is so designed that the finger or pin has a tendency to stick into the strap and impede the removal of the strap from the buckle. In order to overcome this difficulty, Mr. Edward A. Mainguet, of Evangeline Post Office, near Jennings, La., has invented a buckle so constructed that its finger can be swung to one side

IMPROVED BUCKLE.

out of the way of the strap, permitting free and unimpeded removal of the strap. As shown in the accompanying illustration, the buckle comprises a frame of the ordinary form, with the usual cross piece. At the center of this cross piece is a curved stud so shaped as to permit the finger to swing freely in a plane parallel with that of the frame and also to have limited movement in a plane perpendicular thereto. When it is desired to remove the strap, the pin is disengaged therefrom, and swung laterally to a right angle with the direction of the strap; thereupon the strap can be freely drawn through the buckle. It will be evident that this type of finger fastening may be used in any of the ordinary forms of buckles now in use, and that in place of a curved stud a ring may be used to equal or even better advantage, permitting the same lateral movement of the finger, and a greater movement in the vertical plane.

LOOSE PULLEY OILER.

It is rather a difficult matter to keep a loose pulley properly lubricated with the usual type of oiler without wasting a great deal of oil, owing to the fact that when the pulley rotates, it is apt to throw the oil out by centrifugal action and when it comes to a standstill it is liable to stop with the oil cup on the lower side of the hub, permitting the oil to flow out. As a remedy for these conditions, Mr. William D. Graves, of Browns Valley, Minn., has invented a very simple wheel oiler which we illustrate herewith. The oiler comprises two telescoping members, each of which has its free end somewhat tapered. The inner member is provided with a central bore which affords a passageway leading into the chamber formed by the hollow outer member. This chamber forms a reservoir for the oil, and to prevent leakage of the oil between the sliding members, a packing ring is seated in an annular groove at the upper end of the lower member. The oiler is placed in operative position with the lower tapered end engaging the oil-hole formed in the hub of the wheel and the upper tapered end engaging a hole in the rim of the pulley. The latter hole is customarily formed in pulleys, but if not present can be readily drilled therein. A spiral spring in the oil reservoir presses the members apart and causes the tapered points to be snugly seated in these sockets. The oil in the reservoir is fed to the bearing surface of the pulley through the bore of the lower telescoping member. The reservoir has a capacity for holding a large

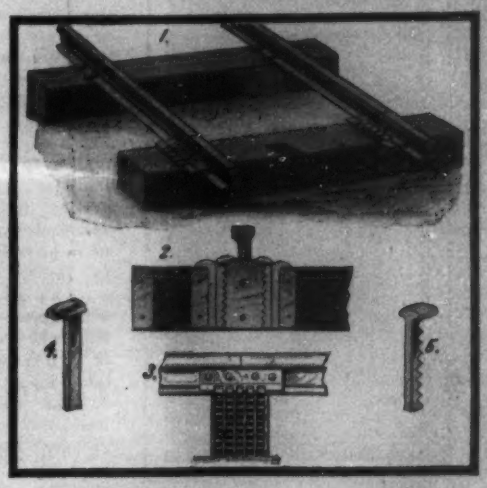


LOOSE PULLEY OILER.

supply of oil, and owing to the fact that the oil is entirely inclosed and can not be wasted, the pulley will be kept properly oiled for weeks without requiring any attention. A most important feature of the device is that it can be applied to the pulley without the use of any tools.

RAILWAY TIE AND FASTENING.

A strong yet comparatively light metal tie, and a novel form of spike for securing the rails to this tie, form the subject matter of a patent recently granted to Mr. William Bryson, a resident of Fifield, Wis. The construction of this tie is fully illustrated herewith. The tie comprises a number of longitudinally-disposed metal plates, placed on edge and spaced apart, as clearly shown in the cross-section, Fig. 3. These plates are all bolted together at the ends, and are inclosed by end and top plates. Arranged between the longitudinally-disposed plates underneath the rails are locking-plates, which are serrated or notched at their opposite edges, as shown in Fig. 2. At each side of the locking-plates, and spaced a short distance therefrom, are abutment plates or blocks. The space between the abutment blocks and the locking-plates is sufficient to permit the insertion of the locking-spikes and the key spikes. One of the locking-spikes is shown in Fig. 5, and it will be observed that it is provided along its inner side with teeth adapted to engage the notches of the locking-plates. After a locking-spike is placed in position with its head engaging the bottom flange of the fish-plate, it is driven firmly into engagement with these notches by means of the key-spike shown in Fig. 4. This tie is designed particularly for use at the joints of the railway track, to insure a perfectly firm and reliable hold on the rails at these



METAL TIE AND NOVEL RAIL-FASTENING.

points. At other points wooden ties of ordinary type may be safely used. Owing to the pounding which occurs at the joints of a track, the ordinary wooden ties at these points quickly wear out. With the joints supported by a substantial metal tie, such as the one illustrated, the frequency and cost of repairs would be greatly diminished.

CIGARETTE BOX WITH MATCH RECEPTACLE.

The cigarette box illustrated herewith will appeal to the smoker who is invariably just out of matches. It seems but common sense to furnish with the cigarettes in each box, a means for lighting them. This is very simply and neatly done in the box which we illustrate, and which was invented by Mr. Alcibiades G. Psiaki, of 104 Wall Street, New York. The box has the usual construction, except that a chamber is formed at the inner end of the tray portion to receive the matches. This chamber is open at one side and is adapted to register with an opening in the side of

CIGARETTE BOX WITH MATCH RECEPTACLE.

the outer casing when the tray is drawn out half way. At the forward end of the tray is a sanded portion on which the matches may be ignited. When it is desired to use a cigarette the tray is drawn out until the match chamber is brought in line with the opening in the casing. A cigarette may then be taken out and lighted by means of a match shaken out of the chamber and ignited on the sanded portion. In order to prevent the cigarettes from falling out when the box is tilted to remove the matches, a flap is provided which fits over the cigarettes to within a short distance of their outer ends. The construction of the box is such that it can be very cheaply manufactured.

AUTOMATIC ELECTRIC FIRE ALARM.

A patent has recently been granted to Mr. Herbert Trull, of Fernie, Box 311, British Columbia, Canada, for an improved electric alarm, which isautomatically sounded to indicate the presence of fire. This alarm system is particularly adapted for use in hotels or apartment houses. An alarm device is placed in each room of the building, and when the heat in any room rises to a point which indicates the existence of a fire, an annunciator in the clerk's office automatically reports in what particular room the fire has started, and at the same time the alarm bells throughout the building are sounded to warn the occupants. The alarm device used is illustrated in the accompanying engraving. It consists of a baseboard, at the upper end of which a box is mounted on a vertical rod supported in brackets. Within the box is the electric alarm bell. Hinged to the box at the top is a contact lever, whose left-hand end is weighted to normally hold the lever in the position illustrated by dotted lines. The lever may, however, be held in the position indicated by full lines, when its outer end engages an eye in one end of a bell-crank lever, which is hinged to the lower right-hand corner of the box.

AUTOMATIC FIRE ALARM.

The opposite end of this bell-crank lever is arranged to be swung to the position illustrated in dotted lines, when the heat reaches a predetermined degree of temperature, thus releasing the contact lever. The bell-crank lever is raised by means of a plunger, which projects from one arm of a U-shaped tube mounted on the baseboard. The plunger head rests on a quantity of mercury held in this tube. The other arm of the tube is hermetically sealed, and contains at its extreme end a quantity of liquid, which is easily volatilized by excessive heat, thus depressing the mercury and raising the plunger to the dotted position. This, as above stated, causes the contact lever to drop, and while dropping it brushes past a contact spring, which momentarily completes the circuit to the annunciator and sets it. The weighted end of the lever then comes to rest on a second contact spring, which completes a circuit through all the alarm bells in the building, and sets them to ringing. The alarm box, it will be observed, is held in place by means of a collar and set screw on the supporting rod. By moving this collar up or down, the box will be raised or lowered, and the contact lever will be released at a correspondingly higher or lower degree of temperature. The exact degree of temperature at which the parts will be set in action is indicated on the scale placed at one side of the baseboard.

Brief Notes Concerning Patents.

In the handling of the suburban traffic of the larger cities, the greatest source of delay is that at the stations, where much time is lost in getting the passengers on and off the trains. When this problem was struggled with at the time of the Columbian Exposition, the Illinois Central overcome the trouble by the construction of cars with doors extending the entire length and on both sides. It was by the use of these cars that the company was enabled to safely transport 19,000,000 passengers with great facility; and while these cars were eminently successful in operation they were not regarded as entirely suited for the regular railroad traffic. An improved car has just been adopted by that line which it is thought will meet all the demands, as it was designed by two officers of that line who have had long experience and who have given this particular subject a great deal of study. They are W. A. Sullivan, Assistant Second Vice President, and William Renshaw, Superintendent of Machinery. The cars are vestibuled and are supplied with side doors extending the entire length of the car. The doors may be operated singly or all at once by a train hand from his position at the end of the car. The seats extend crosswise in the middle of the car and each seat has accommodations for four persons. An eighteen inch aisle extends the whole length of the car on either side, so that when a passenger has entered at one of the doors he can find his way to any part of the car or to any of the other cars of the train. This is a feature which was not present in the construction of the cars referred to above for the Columbian Exposition service, and it was one of the serious drawbacks of their use that passengers were first compelled to find their seats before entering the car.

A new type of fishhook, the invention of J. E. Hindon Hyde, of New York, shows how even the simplest things of common life can be readily improved. The improvement consists in transferring the barb of the hook from the inside of the point, that is, between the point and the shank, to the opposite side of the point so that it lies on the outside of the hook. The advantage of the new hook is that it renders it much more difficult for a hooked fish to release himself upon a slack line. This is due to the fact that the new location of the barb creates a bar to the extraction of the hook after it has penetrated, and also to the fact that the barb, instead of playing against the soft mucous membrane of the mouth to prevent release as in the old style of hook, presses against the hard epidermis.

IMPROVED SUPPORT FOR BICYCLE HANDLE BARS.

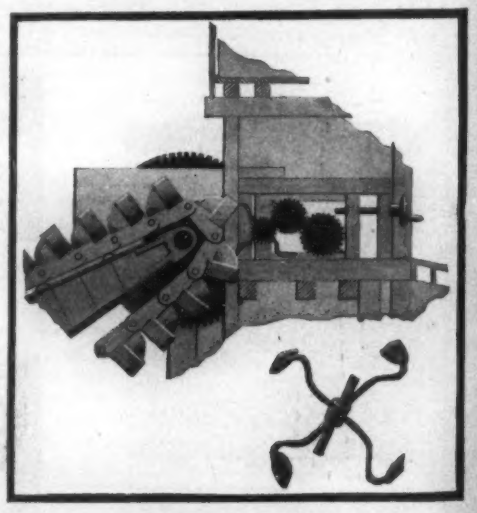
Considerable difficulty is often experienced when resting a bicycle against a wall, tree or other support, owing to the projecting handle bars, which are apt to swing the front wheel about and cause it to run away from the support. To overcome this difficulty Mr. Robert H. Tate, of 392 Columbia Street, Portland, Ore., has invented the bicycle handle-bar support illustrated herewith, which permits the handle bar to be swung about until it lies parallel with the front wheel, whenever desired. When in riding position, however, the handle bars are automatically locked in a position at right angles with the front wheel. The handle bars are secured in a clamp provided with a body sleeve which fits over the tubular handle-bar post. The latter is secured to the front fork stem by means of a tapered nut which expands the lower end of the handle-bar post and presses it into frictional engagement with the fork stem. A collar is supported on the top of the handle-bar post, and over this an adjusting cap is mounted which controls the locking mechanism. The locking device consists of a bar formed at its lower end with a split sleeve adapted to fit tightly within the hollow handle-bar post. Near its upper end the bar is bent or crooked to engage a slot in the upper edge of the handle-bar post, and also one of three slots formed in the upper edge of the body sleeve of the handle-bar clamp. The extreme upper end of the locking bar engages a cam slot in the adjusting cap. When this cap is turned the cam slot draws the locking bar toward the center of the cap and out of engagement with the body sleeve of the handle-bar clamp, permitting the latter to be swung around either to the right or to the left until the handle bars are parallel with the front wheel, when another one of the three slots is brought into registry with the slot in the handle-bar post. The adjusting cap is automatically brought back to normal position by a coil spring acting

IMPROVED SUPPORT FOR BICYCLE HANDLE BARS.

thereon, and the locking bar is thus free to slip into the registering slots, locking the parts securely together.

DREDGE ATTACHMENT.

In the accompanying illustration we picture a means for automatically clearing out the buckets of dredges. This means is especially adapted to dredges in which the buckets are arranged on an endless chain, the buckets dumping as they turn over at the upper part of the dredge. In this class of dredges, especially when working in clay and stiff soils, the buckets often fail to dump completely, the amount accumulating therein and eventually entirely filling them with a substance of such consistency that it cannot be dislodged in the ordinary operation of the dredger. To overcome this objection Mr. Herman A. Funke, of Elizabethtown, New Mexico, provides a scraper device, which is arranged to automatically enter each bucket as it arrives at the dumping position, and throw out therefrom all the accumulated material. As shown in our detail view, the scraper comprises a hub carrying radial arms, on the ends of which the scraper blades are secured. The scraper is mounted on a shaft, which has bearings in a frame arranged to be adjusted to any desired position by means of an adjusting screw. The arrangement of the scraper blades is such that as each dredger bucket turns down into dumping position, it moves over one of the scraper blades, bearing it down, and thus rotating the scraper device. The same operation, of course, is repeated as each bucket engages



DREDGE ATTACHMENT.

the scraper. Every time the bucket moves into engagement with one of the scraper blades, the blade is caused to scrape through the bucket, and effectually clear out the accumulation therein. In order to prevent the scraper from rotating by its own momentum, and thus disturbing its proper relations to the successively arriving buckets, a train of gearing is connected with the scraper device, which produces a certain amount of friction that retards its rotation.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

THIRD-RAIL SUPPORT.—L. STEINBERGER, New York, N. Y. In regard to this improvement, it will be understood that in using third-rails in connection with electric lines it is desirable to allow for various motions of the rail member, and especially for temporary disconnection as between the rail-insulator and the supporting member which normally engages the same. It is also essential to provide for allowing the rail to rock slightly in lateral direction and for the rail to rock slightly in a plane coincident with its general length. In other words, to provide for certain amount of flexibility in the rail-section, so that the section adjusts itself under varying conditions, thus insuring more perfect contact with trolley shoe.

Hardware.

TUBE EXPANDING, BEADING, AND CUTTING TOOL.—H. G. LYKKEN, Grafton, N. D. The object of this invention is to provide novel details of construction for a tool which adapts it for convenient and reliable service, facilitates the exchange of parts to effect the expansion, beading or cutting off of a flue or tube while in place, and affords a simple practical implement at a moderate cost.

LEVEL AND PLUMB.—A. J. PATTERSON, Huntsville, Ala. This improvement comprises a stock recessed for the bob, and in the recess cross-pins for stopping the bob in different positions and above the recess a curved graduated face, the stock being also provided with a transverse opening for use in indicating a vertical line, the bob having laterally-projecting pivot-pins and indicating pointer and arm, and the weight below the same, the weight provided on its under side with shoulders to engage with stop-pins in recess, and screws turned through opposite sides of the stock into the recesses therein, and provided in their inner ends with sockets extending lengthwise and of uniform diameter, and adapted to receive pivot-pin on the bob or pendulum.

Machines and Mechanical Devices.

MUSIC-LEAF TURNER.—L. S. MILLER, New York, N. Y. This invention relates to improvements in devices for turning sheets or leaves of music, the object being to provide a device that may be easily adapted to a piano or similar instrument or to a music-rack and by means of which the leaves of music may be consecutively turned without interfering with a person's playing.

PROSPECTOR ORE-BREAKER.—A. C. CALKINS, Los Angeles, Cal. This breaker operates with a compound motion in causing the jaws when the handle lever is oscillated to alternately approach and recede from each other and also an up-and-down rubbing motion of one jaw upon the other that produces with a light construction a very powerful crushing effect. By connecting a ball to the right-angular extension of the lever increased motion is obtained for the front jaw, and at the same time the powerful effect of a toggle is made available whenever the ball and centers fall into line. Means prevent the lever falling too far outwardly when released.

MIXING MACHINE.—E. L. RANSOME, New York, N. Y. The chief object in view in this case is to produce a construction which may be used to good advantage both as a continuously-acting mixer or as a batch-mixer without alteration of either of its parts. A further object is to equip the machine with means which operate to intermingle the materials thoroughly and rapidly; furthermore, to provide for the rapid discharge of materials when desired, and, furthermore, to provide reversible driving means for rotating the revoluble drum in one direction or the other.

BELT GUIDE AND SHIFTER.—W. P. RUTH and W. H. JONES, Downs, Kan. The invention refers to a belt holder and shifter designed especially for use in traction and other agricultural engines, but capable of use in other connections. By means of their invention the belt may be held true on the pulley during the operation of the engine, and the shifter may be operated to throw the belt off of the pulley instantly and at any time during the operation of the apparatus.

Of General Interest.

PIPE BAND AND FASTENING.—A. W. HIGHT, Ballard, Wash. The invention is designed especially for holding together the staves of stave-piping—that is to say, of piping formed of wooden staves laid longitudinally and bound together. The invention is, however, useful in various other connections. For example, it may be used to advantage on water tanks and the like. The invention resides in certain peculiar constructions of the fastening and in the form and arrangement of the band which coacts with the shoe.

VIOLIN.—J. A. HECKENBACH, Chicago, Ill. The object of the improvement is the provision of a new violin, violoncello, or similar stringed musical instrument which is simple and durable in construction and arranged to insure the production of a full, sweet, and mellow tone when the instrument is played.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of the paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**
MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 5628.—For makers of furnaces for smelting lead, tin and Babbitt dross.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 5629.—For a small canning outfit.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 5630.—For machinery to manufacture handkerchiefs by weaving.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 5631.—For machinery to cut, hem, etc., cotton or linen cloth into handkerchiefs.

If it is a paper tube we can supply it. Textile Tube Company, Fall River, Mass.

Inquiry No. 5632.—For apparatus to weave, cut and hem handkerchiefs when made from piece.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 5633.—For the manufacturers of the International typewriter.

WANTED.—Exclusive sale improved automobile specialties. Specialties, Box 773, New York.

Inquiry No. 5634.—For makers of the vacuum disc or suction shoe for walking upside down on the ceiling.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 5635.—For a toy balloon for experimenting.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Machine Company. Foot of East 138th Street, New York.

Inquiry No. 5636.—For makers of board suitable for playing cards.

Any metal, sheet, band, rod, bar, wire; cut, bent, crimped, punched, stamped, shaped, embossed, lettered. Dies made. Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 5637.—For machinery for making paper and straw board from straw.

Wanted position as superintendent or foreman machine shop or manufacturing. Wide experience and thoroughly practical. Address Foreman, Box 773, N. Y.

Inquiry No. 5638.—For makers of machinery for making towels.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 13 South Canal Street, Chicago.

Inquiry No. 5639.—For machines for cutting tobacco leaves, green or dry.

INVESTORS.—Have six United States, five Canada and ten European patents for immediate sale. Abstracts titles complete. Act at once. Golden opportunity. Particulars free. H. W. Gander, Rudy, Pa.

Inquiry No. 5640.—For makers of a machine for breaking cocoanuts and removing the kernel.

Inquiry No. 5641.—For manufacturers of tea-making machinery for family use.

Inquiry No. 5642.—For makers of small drop forgings.

Inquiry No. 5643.—For makers of flower and plant pots from earth and fertilizer.

Inquiry No. 5644.—For castings for a steam engine bore about 2 inches, stroke about 3 inches.

Inquiry No. 5645.—For makers of bone and pearl backs for collar buttons.

Inquiry No. 5646.—For hand machines for making brooms, also for hand machines for manufacturing small paper boxes used by druggists.

Inquiry No. 5647.—For manufacturers of hair and cotton pickers or shredders.

Inquiry No. 5648.—For parties manufacturing Ferris wheels.

Inquiry No. 5649.—For the present address of Cook's Patent Bow Facing Oar Co.

Inquiry No. 5650.—For the address of Baker's Patent Bow Facing Oar Co.

Inquiry No. 5651.—For the address of Allen's Patent Bow Facing Oar Co.

Inquiry No. 5652.—For a small thicknessing machine that will plane and thickness short lengths of teak.

Inquiry No. 5653.—Wanted, to buy in quantities, a small, cylinder-shaped instrument 3 or 5 inches long, fitted with certain lenses, which apparently enables one to see the bones in the hand (an imitation X-ray machine).

Inquiry No. 5654.—For makers of shoe-polishing devices, such as motor brushes, etc.

Inquiry No. 5655.—For manufacturers of and dealers in gilsonite and elaterite.

Inquiry No. 5656.—For manufacturers of nailing machines for box and case making, also printing machines for printing ends and sides of boxes and cases.

Inquiry No. 5657.—For makers of self-nailing cheese box machines.

Inquiry No. 5658.—For metallotype paper for export.

Inquiry No. 5659.—For manufacturers of household specialties.

Inquiry No. 5660.—For manufacturers of square brass tubing.

Inquiry No. 5661.—For makers of musical instrument novelties, for use of drummers, show men, etc.

Inquiry No. 5662.—For a 5 h. p. gasoline engine, air-cooled, for automobiles, also for makers of vehicle springs, such as used on runabouts.

Inquiry No. 5663.—For a complete apparatus for turning waste soap into blocks or bars, without melting by fire.

Inquiry No. 5664.—For manufacturers of column clamps.

Inquiry No. 5665.—For dealers in light and heavy rope and whips, also rawhide.

Inquiry No. 5666.—For makers of metal collapsible tubes.

Inquiry No. 5667.—For a machine known as a granulated fuel cutter, for cutting up trash and waste wood, for bundling.

Inquiry No. 5668.—For the manufacturers of the new upholstered furniture and button brush, made of bristles, 3 rows, with a bristle pointed end.

Inquiry No. 5669.—For dealers in unvulcanized, masticated sheet rubber, for making toy balloons, etc.

Inquiry No. 5670.—For the manufacturers of Clark's expansion bit.

Inquiry No. 5671.—For the makers of the pneumatic saw with which two men can cut through a 5-foot log in five minutes.

Inquiry No. 5672.—For makers of portable houses.

Inquiry No. 5673.—For makers of ventilating machinery, electric and otherwise.

Inquiry No. 5674.—For makers of glass novelties and bottles; also of collapsible tubes and small steel coil springs 1-8 or 5-16 in. diameter.

Inquiry No. 5675.—For parties handling a complete line of miniature yacht fittings.

Inquiry No. 5676.—For a motor to saw wood.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(9411) J. G. W. wishes to know: 1. Whether a perfectly round iron ball two inches in diameter will attain greater momentum, or velocity, in rolling down an incline fifty feet long, with a fall of four feet, than it would, at the moment of stopping, if dropped four feet? A. The momentum of an iron ball rolling down an incline is the same theoretically as when falling the same height, save the rolling friction, which somewhat lessens the actual momentum. 2. If there is no difference, why would not a hydraulic ram operate as well if the water was supplied through a perpendicular pipe, instead of down an incline, as is always recommended? A. The conditions as to the pipe of a hydrant, i. e., ram, are quite different. For a given height, the weight of water moving in a long inclined pipe is much greater than in a vertical pipe of the same height; and the momentum of the moving mass is due to its weight and velocity. Momentum is the force that drives the ram.

(9412) W. H. S. says: Would you kindly give me a little information through your paper or otherwise, as to the practicability of using gas taken from a gas well, storing it in a strong receiver compressed to a safe pressure, for transportation purposes, and used in a gas engine. Possibly this matter has been tried and it may not be practical, but I have not heard of it. What amount of gas could be stored in a receptacle, say 12 x 60 inches, and what pressure would it be advisable to use for transportation? I presume that a great deal would depend on the cost of transportation. I understand that compressed air is being used for power and air is being stored in strong cylinders; gas would have much more power to the cubic foot and cost very little at the well and a cylinder should not cost much for transportation. A. The principal difficulty in using compressed natural gas for power purposes as in explosive motors, is the cost of compressing to the pressure required to make it available and convenient for transportation. It has been shown that to compress 100 cubic feet of gas to 1,000 pounds pressure per square inch by the four-stage or cheapest method requires 31 horse-power, and to 2,000 pounds pressure 38 horse-power. A cylinder of the size you describe, of 4 cubic feet capacity, will hold at 1,000 pounds pressure 257 cubic feet of free gas, costing over 79 horse-power to compress it. With a liberal allowance of 15 cubic feet of free gas per horse-power in an explosive motor, it will be seen that but 17 horse-power is available from an expenditure of 79 horse-power for compressing the gas.

(9413) A. D. says: It is a well-known fact that during spawning season fish will traverse vast distances and overcome natural and artificial barriers in their endeavor to reach shallow water and quiet streams where to deposit their eggs. One claimed that salmon could (with great effort, it is true) mount to the top of falling water, provided the volume of water was large enough to admit of free, unrestrained action. He had seen photographs of such feats and it was his opinion that with gigantic effort some could even succeed in swimming up Niagara Falls. This was looked upon as a good "fish story." Could you inform us whether any fish (say salmon) could perform such a marvelous feat? It would seem possible that as fish can swim against very strong currents they could also mount in such a large volume of water as comes over the American Falls. This, although almost vertical, does not seem to rush with such great velocity until the great mass of water has fallen some distance. After the first mighty effort it would require to get a start, why could they not reach the top of the Falls? You need not publish all I have written, but will satisfy us if you answer the query substantially but directly. A. The theoretical velocity of the water at the foot of Niagara Falls is not far from 100 feet a second. Its real velocity is probably quite a little less than this owing to the resistance of the air. It doesn't seem to us at all probable that even the strongest salmon could rush into such a mass of water with a velocity sufficiently great to enable it to rise any distance above the water in the river below. Of course, also the mass of falling water plunges far below the water in the basin at the foot of the falls before it entirely loses its downward motion. The length usually assigned to the water in the basin is about 180 feet. The difficulties of the case are such that we should think it extremely unlikely that any fish could ever rise to the top of Niagara Falls.

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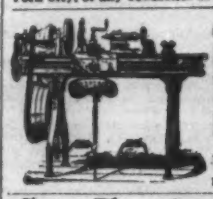

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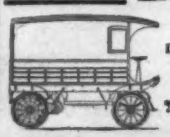

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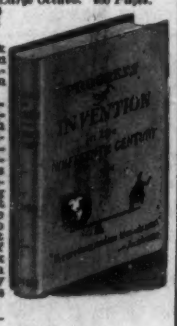

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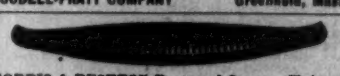

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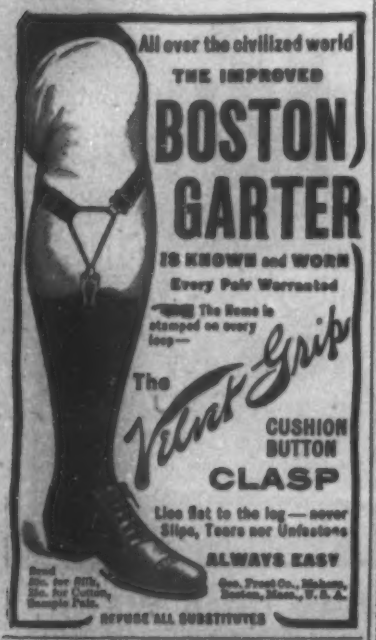

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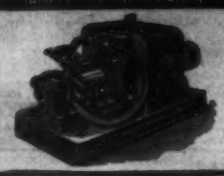

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